ENGINEERING AND MINING JOURNAL

A McGRAW HILL PUBLICATION

MAY 1952

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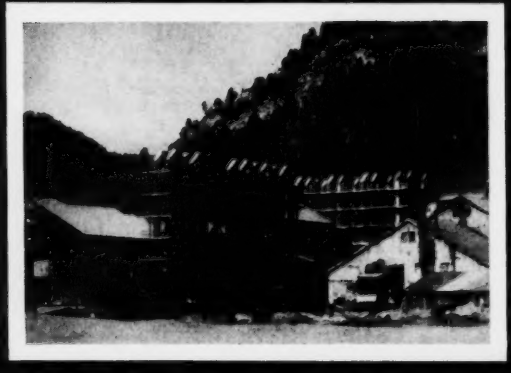
FOUNDED 1866

How Duval Potash Solved A Shaft-Sinking Problem By Grouting..

..P. 99

WHERE DUPONT GETS 100,000 TONS OF ILMENITE A YEAR...P. 82

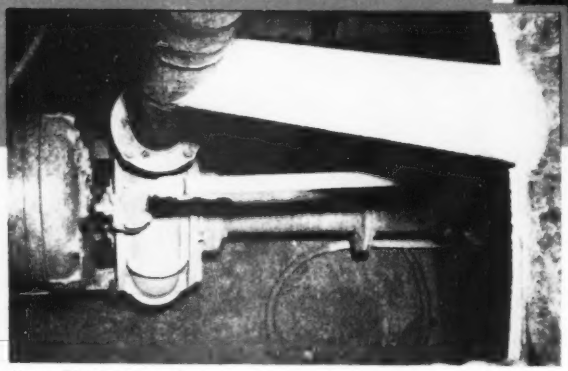


THE ONLY ANTIMONY SMELTER IN THE U.S. INCREASES OUTPUT...P. 72

THEY'RE MOVING THIS HEADFRAME TO SAVE TIME AND MONEY...P. 78

Pumping sand at Sierra

Sierra ROCK PRODUCTS CO

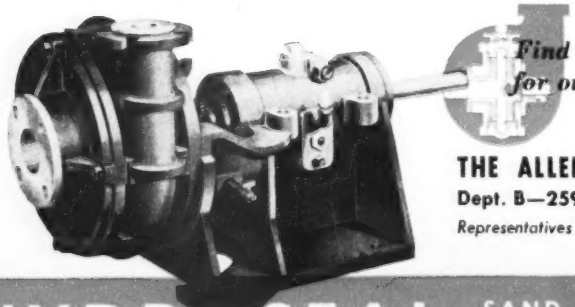


Frame BC3-5 Hydroseal Sand Pump in pump pit.

Discharge from pump handling classifier overflow.

The men at Sierra Rock Products Co., Monrovia, California, swear by the Hydroseal Sand Pump that handles the classifier overflow in their sand washing process. Like the rest of its brethren in the mining world, it can be depended on to maintain its efficiency long after other pumps have said "uncle," because close clearances are protected from wear by clear sealing water. Besides reducing repair costs, this unique design feature results in greatly lowered power requirements.

Yes, mill men expect more from Hydroseals . . . and they *get* more.



Find out for yourself—write for our latest catalog No. 451

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives in Most Principal Cities

HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

for EXTRA production without additional manpower

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CARSET JACKBITS

offer you all these time saving, labor saving advantages for faster easier rock drilling in practically every type of ground

CARSET JACKBITS WEAR LONGER–because they retain their Tungsten Carbide cutting edges after drilling many feet in the *hardest rock.*

INCREASE DRILLING SPEED 50% OR MORE–because they maintain their original high drilling speed for the full depth of the hole.

BOOST TONNAGE 20% OR BETTER–because they permit drilling deeper holes and pulling longer rounds. This means more rock or ore broken per shift.

PRACTICALLY ELIMINATE BIT CHANGES–because gauge wear is negligible and uniform diameter holes can be drilled to any practical depth.

SAVE UP TO 30% ON DYNAMITE–because they eliminate tapered holes, permit smaller hole diameters, and concentrate more dynamite in the bottom of the hole.

CONSUME UP TO 50% LESS DRILL STEEL–because the smaller average size, sharper-edged bits drill easier and are kinder to drill steel.

REDUCE AIR CONSUMPTION AT LEAST 40%–because they permit the use of lighter drills, smaller diameter holes and much higher drilling speeds.

REDUCE MAINTENANCE COSTS 30% OR MORE–because they lighten the load on drills and equipment, greatly extending the service life between overhauls.

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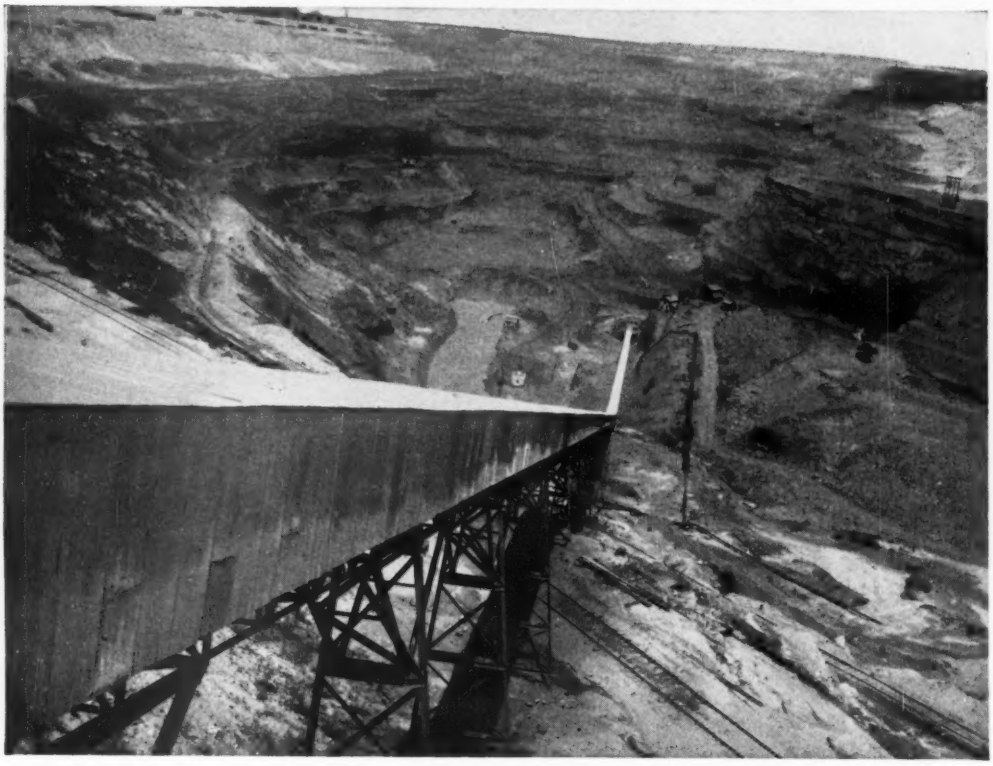
CARSET JACKBIT

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



B. F. Goodrich steel cable belt

for longer, higher, single-flight conveyors

THAT iron ore mine is so deep a 30-story building could be built in it and the roof wouldn't reach the surface. The problem of getting ore from the bottom of the mine up to railroad cars was solved when a B. F. Goodrich steel cable belt was installed. That was 4 years ago, and the steel cable belt has been at work ever since, lifting 1,000 tons of ore an hour, over a third of a mile up and out of the mine. The belt is still in perfect condition, good for years' more service. Here's why the B. F. Goodrich steel cable construction can make conveyor belts of lengths and lifts far exceeding anything formerly possible:

Strength for long hauls — In this exclusive B. F. Goodrich belt design, individual steel cables run lengthwise, each completely surrounded by rubber. These parallel cables add tremendous strength, yet are flexible so that troughing is natural, belt keeps centered on idlers, spillage is held to a minimum.

Strength for long life — Two plies of nylon and cotton fabric, placed across belt width, act as a shock absorber, permit belt to "give" crosswise when impact occurs, prevent longitudinal tearing.

Single-flight economy—Steel cable construction now makes possible a single-flight conveyor for installations where a combination of high lifts and long distances exists. It eliminates the transfer points necessary with a conveyor system built in several stages with ordinary belts.

The B. F. Goodrich steel cable belt was especially designed for the efficient handling of material under the severest conditions — high lifts, long centers, heavy impact. Your local BFG distributor can give you additional information, or write *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.* (Available in Canada)

Conveyor Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

VOLUME 153 — 86th YEAR OF PUBLICATION — NUMBER 5

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Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. **Publication Office, 1309 Noble St., Philadelphia 23, Pa. Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y.** Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Engineering and Mining Journal—Subscription Service, 1309 Noble St., Philadelphia 23, Pa., or 330 West 42nd St., New York 36, N.Y. Allow ten days for change of address.

Subscriptions are solicited only from management, production, and maintenance executives and engineers in the metal and nonmetallic mining and refining industry. Position and company connection must be indicated on subscription orders.

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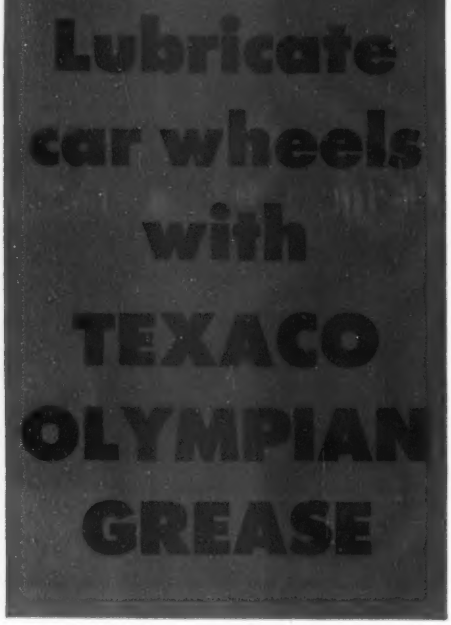
Price of this issue 50c. Subscription rates: United States and possessions, $3 a year, $4 for 2 years, $5 for 3 years. Other Western Hemisphere, $5 a year, $8 for 2 years, $10 for 3 years. Elsewhere $15 a year, $25 for 2 years, $30 for 3 years. **Please indicate position and company connection in all subscription orders.**

Entered as second class matter May 24, 1951, at the Post Office at Philadelphia, Pa., under the Act of March 3, 1873. Copyright 1952 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Printed in U.S.A.

GET EASIER STARTS... MAKE HEAVIER HAULS



Cars lubricated with *Texaco Olympian Grease* start more easily and roll more smoothly all year 'round. No seasonal change is necessary. Thus, longer trains can be hauled, more tonnage moved. In addition, *Texaco Olympian Grease* assures longer bearing life and reduces maintenance costs.

The properties that make *Texaco Olympian Grease* superior to other greases are these: 1) extra-high resistance to oxidation; 2) freedom from separation whether in use or in storage; 3) ability to stay in the bearings for longer-than-ordinary periods; and 4) ability to act as effective seal against dirt and moisture. *Texaco Olympian Grease* is available in three consistencies to meet all requirements of plain, cavity hub or anti-friction bearings.

To protect wire rope, use *Texaco Crater A* – it lubricates the strands, preserves the core, keeps rope strong longer under wet or dry conditions. On open gears, use *Texaco Crater X Fluid* – it *goes on* as a liquid, *stays on* as a tough, protective film that cushions shocks and prolongs gear life.

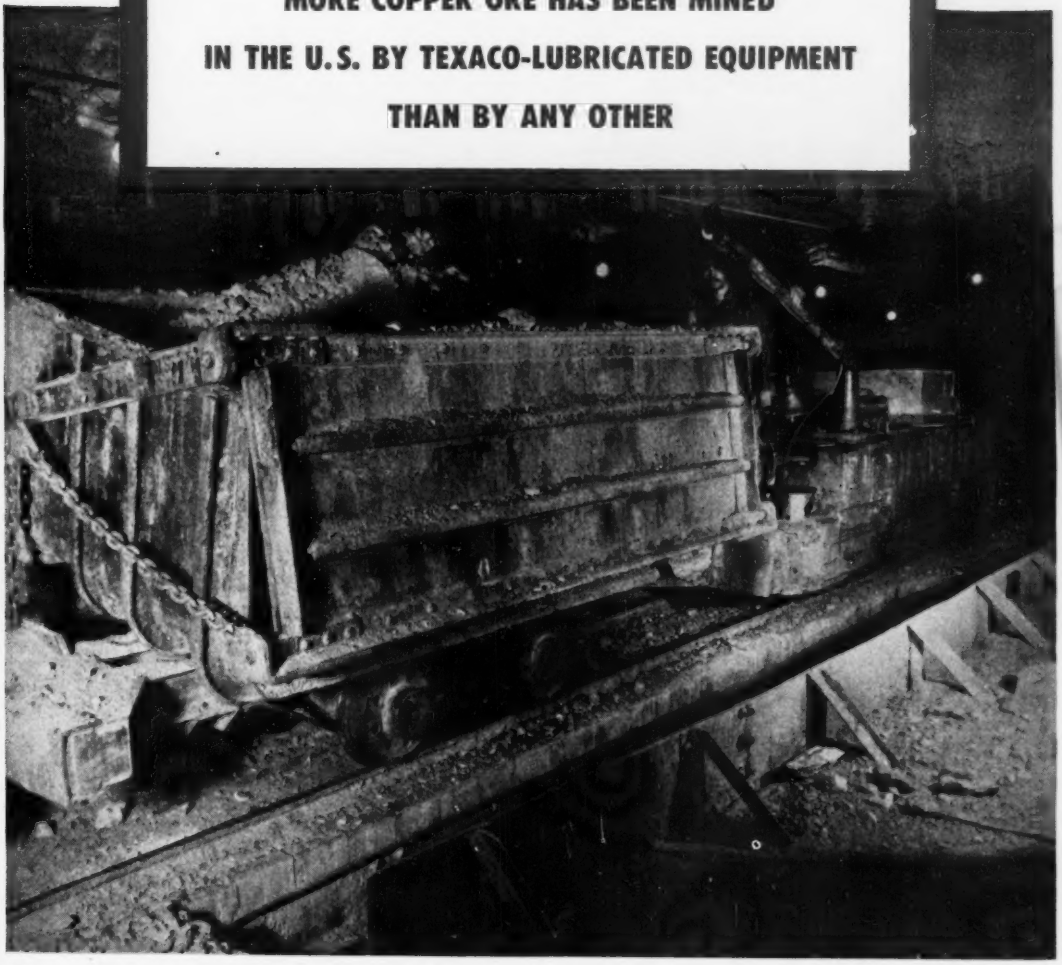
A Texaco Lubrication Engineer will gladly help you use effective lubrication to improve efficiency and reduce costs throughout your mine. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

TEXACO

TEXACO

FOR MORE THAN 20 YEARS,
MORE COPPER ORE HAS BEEN MINED
IN THE U.S. BY TEXACO-LUBRICATED EQUIPMENT
THAN BY ANY OTHER



Lubricants and Fuels
FOR THE MINING INDUSTRY

Faithfully yours
50
for Fifty Years

NO-TURN SHUTTLE HAUL

In confined underground operation, fast-shuttling Dumpsters are ideal for no-turn hauling in tunnels and along narrow passageways. Also note how low rear entry to Dumpter body permits easy loading under low ceiling. Compact body is 8' x 8' for loading over end or sides.

This mountain-side job shows typical no-turn shuttle advantage. Hauling along narrow ledge, Dumpter spots close to Koehring 1½-yard 605 — gets its load, drives to fill, dumps, and returns to the shovel — without turning. Dumpters are operated with equal ease in both directions.

increases hourly output over 10%

With Koehring fast-shuttling Dumptors, there is no need to turn at the loading unit, along narrow haul roads, or at the dump. Koehring constant-mesh transmission gives the same 3 fast speeds forward and reverse. Every turn saved cuts 15 seconds off your cycle time, and adds up to a big increase in yards hauled per hour.

On a 1,000-foot haul, eliminating only 2 turns saves ½ minute every round trip. Where you would get an average of 13.6 trips per hour with 2-turn operation, Dumptor *no-turn shuttle hauling* gives you 15.4 trips. That's an increase of 1.8 trips an hour on the same, 1,000-foot haul.

Fast, easy spotting and 1-second gravity dump also help keep production high. Your Koehring distributor can show you many other cost-cutting advantages with heavy-duty, 6-yard Dumptors.

KOEHRING COMPANY, Milwaukee 16, Wis.

KOEHRING DUMPTOR®

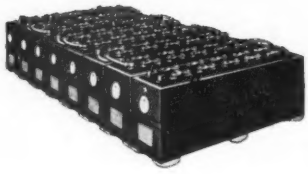
Subsidiary Companies: JOHNSON • PARSONS • ERWIN-MIX

ANNOUNCING

THE IMPROVED

Exide-Ironclad

BATTERY



YEAR AFTER YEAR, one Exide-Ironclad improvement has followed another. It is a record of continuing progress . . . a steady flow of storage battery developments that have made Exide-Ironclad YOUR BEST POWER BUY AT ANY PRICE.

NOW COMES ANOTHER Exide-Ironclad advance . . . . . a polyethylene insulating tube sealer. This and other improvements combine to give you more dependable battery performance and longer-than-ever battery life.

Exide-Ironclad BATTERIES

YOUR BEST POWER BUY
. . . AT ANY PRICE

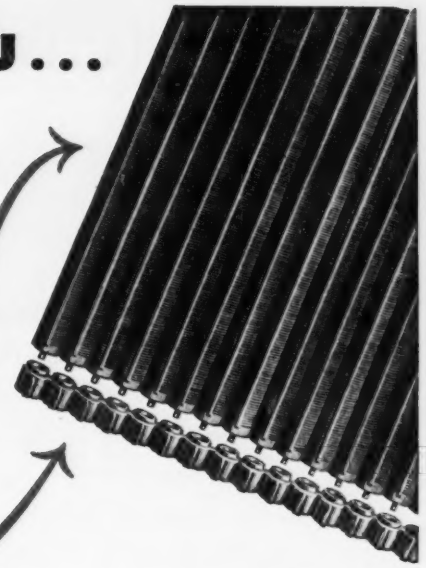
BUILT TO GIVE YOU...

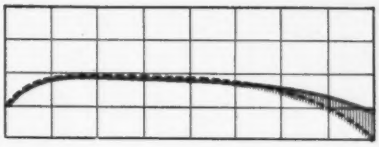
RAPID ACCURATE HANDLING . . . UNIFORM RATE OF HANDLING... HIGH AVAILABILITY... LOW OPERATING COSTS... LOW MAINTENANCE COSTS... LOW DEPRECIATION COSTS... HIGH MANEUVERABILITY... SAFE HANDLING

BECAUSE OF:

IMPROVED POSITIVE PLATE CONSTRUCTION
the long-life grids now contain SILVIUM —an alloy of silver, lead and other components—which make them highly corrosion resistant. Top conducting bar is heavier.

... with the New Polyethylene insulating tube sealer
An insulating sealer for the bottom of the tubes. Acid-proof, non-corroding plastic it fits snugly into slotted tubes of positive plate, and reduces loss of active material. Even the small sediment deposit of the past is reduced 50%. Thus, more active material remains available, and the high battery capacity is sustained for longer working life. (See chart at right.)





PERMANIZED NEGATIVE PLATES
Improved processing, a result of Exide Quality Control assures uniform plates with higher electrical efficiency. These negatives, teamed with the improved positive plates, give you a well-balanced combination for hard service and long life.

NEW SEALING COMPOUND
Through the cooperative efforts of Exide Laboratories and the Franklin Institute, a new homogeneous compound was developed. It makes a permanent seal between the jar and cover, resisting shock without cracking in high or low temperatures.

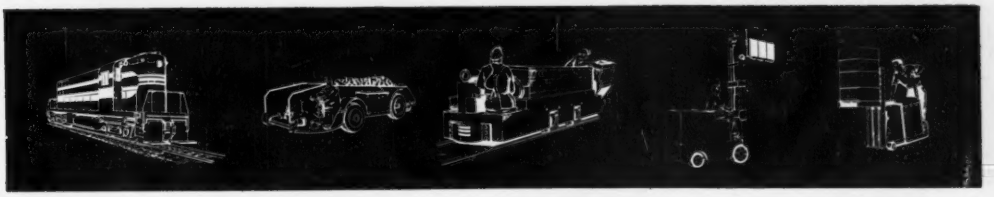
SEAMLESS SHOCK-PROOF JAR
Made of high quality rubber. A scientifically selected combination of tensile strength and elongation provides a sturdy jar built for long life and heavy-duty service.

CORROSION-RESISTANT TRAY GUARD
A plastic acid-resistant steel tray coating with high insulating quality and ability to withstand hard knocks.

NEW UNBREAKABLE PLASTIC VENT PLUGS
Made of unbreakable polyethylene. Can be quickly and easily removed to add water.

Types and sizes for storage battery applications for every heavy-duty service.

Write today for further information.



THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

"EXIDE-IRONCLAD" and "PERMANIZED" *Reg. Trade-marks U.S. Pat. Off.* "SILVIUM" *T.M. Reg. applied for*

only Allis-Chalmers offers you

History-Making

Tracto-Shovel

Thousands of Allis-Chalmers HD-5G 1-yd. front-end shovels are making history . . . handling an endless variety of excavating and material handling jobs faster, at lower cost than ever before.

Now . . . to meet the challenge of ever-increasing production demands, Allis-Chalmers *multiplies the scope of tractor usefulness even more.*. And here's how.

The same basic design — the same versatility that made the HD-5G so useful can now be yours in 2-yd., 3-yd., and 4-yd. Tracto-Shovels. Combined with the unmatched performance of the new Allis-Chalmers tractors, they give you a real competitive advantage by bringing you a new, faster and better way of getting the job done.

A NEW ERA OF TRACTOR USEFULNESS

Pioneering New Methods — Tracto-Shovels are blazing new trails in excavating and material handling . . . doing traditional jobs in a new, better way.

A Size for Every Job — Faster, more efficient operation; at lower equipment investment.

All-'Round Versatility — Not limited to a specific type of operation. Quickly interchangeable attachments adapt Tracto-Shovels to different assignments *in minutes.* Simple truck or trailer transportation between jobs.

Built to Take It — These new Tracto-Shovels are the toughest, strongest ever built. Every part has ample size and strength to do its job.

14 different attachments

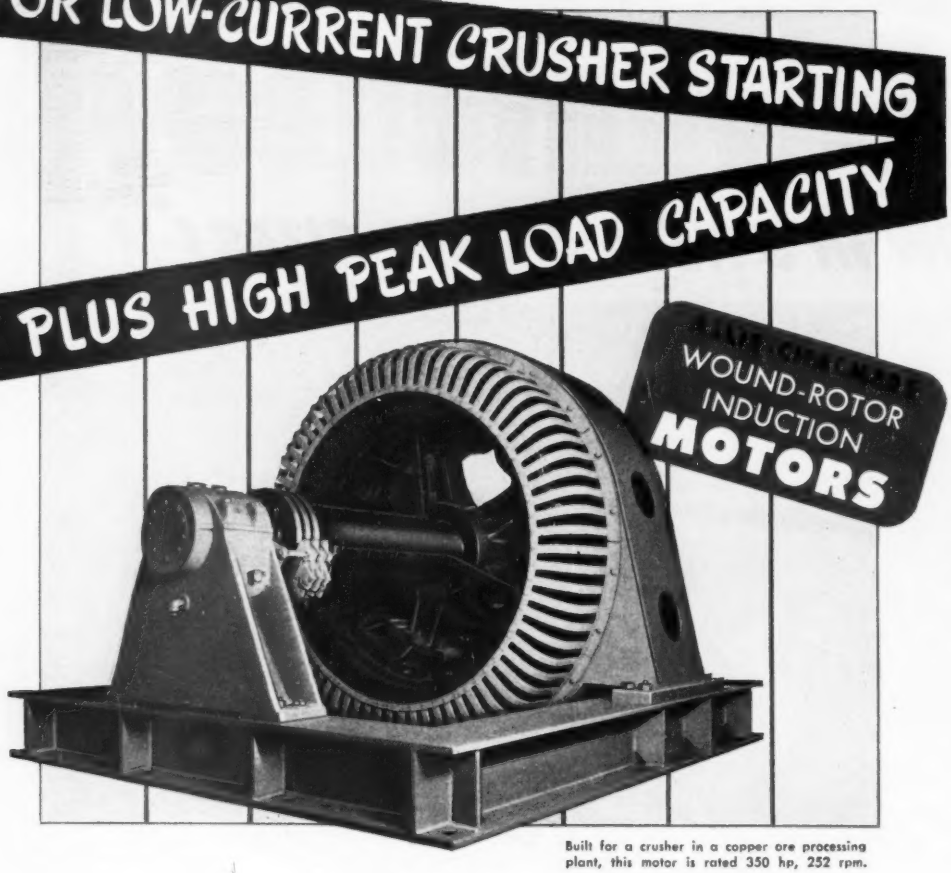
Standard buckets, heavy-duty rock buckets, rock forks, bulldozer blades, light materials buckets (up to 7 cu. yd.) . . . plus other attachments for some models.

1 yd. HD-5G	2 yd.* HD-9G	3 yd.* HD-15G	4 yd.* HD-20G
40 Drawbar hp.	72 Drawbar hp.	109 Drawbar hp.	Hydraulic torque converter drive
Dumping height (bucket hinge pin): 9 ft., ¼ in.	Dumping height (bucket hinge pin): 11 ft., 4 in.	Dumping height (bucket hinge pin): 12 ft., 8 in.	175 net engine hp.
Total weight: 16,200 lb.	Total weight: 29,900 lb.	Total weight: 40,000 lb.	Dumping height (bucket hinge pin): 13 ft., 5 in.
			Total weight: 61,600 lb.

Advantages
NOW IN 3 NEW, BIGGER SIZES!
World's Largest Front-End Shovel
— handles toughest excavating and materials handling jobs in a new, faster, better way. Standard bucket capacity — 4 yd.; light materials capacity — 7 yd.
the newest, finest line on Earth!
ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

FOR LOW-CURRENT CRUSHER STARTING

PLUS HIGH PEAK LOAD CAPACITY



Built for a crusher in a copper ore processing plant, this motor is rated 350 hp, 252 rpm.

WHETHER STARTING OR RUNNING, Allis-Chalmers wound-rotor motors fit your crusher drive requirements. Low starting kva minimizes power supply problems. High breakdown torque—250% or more if needed—gives you motors that romp through short-time peak loads . . . and compensates for line voltage drops.

Engineered to your specific requirements, these motors can be built for constant-speed crushing or to provide economical variable-speed operation.

DESIGN ADVANTAGES

Because Allis-Chalmers builds controls and crushers as well as motors, you can be sure that each motor design detail will be suited to the application.

Because each motor is built to uphold the Allis-Chalmers tradition of reliability, you can be sure of rigid shafts, sturdy welded stator yokes, ample even cooling, and liberally proportioned sleeve bearings.

Because routine inspection and maintenance extend motor life, you will get design features that simplify that work. For example, the brush rigging is supported below the bearing center line so that the bearing cap is easily removed.

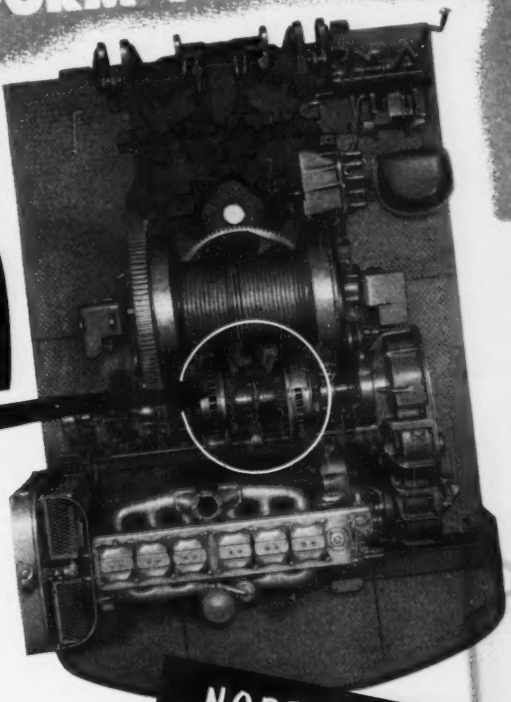
NEW BULLETIN

Large pedestal-bearing induction motors are described in detail in illustrated Bulletin 05B7771. Ask your nearby A-C representative for a copy of this bulletin, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3724

ALLIS-CHALMERS

A NORTHWEST UNIFORM PRESSURE

SWING CLUTCH



can make money!

SMOOTHNESS in spotting loads, freedom from the necessity of constant adjustment, means time saved and time is money on a loading cycle.

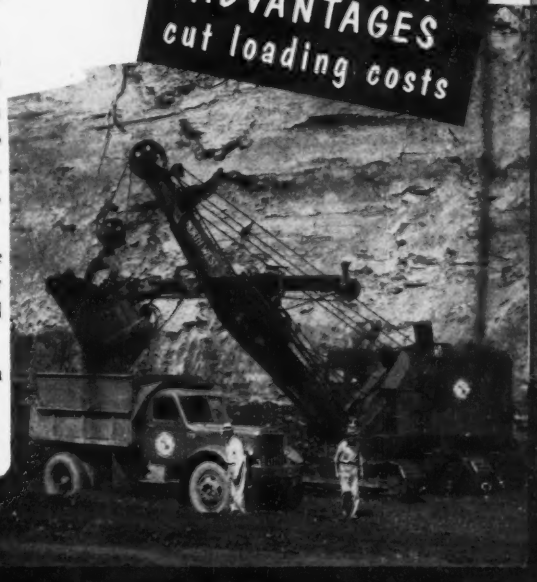
Northwest Swing Clutches are Uniform Pressure Clutches, (*no conventional inside or outside band clutch can be a uniform pressure clutch*). They give smooth, easy operation of the swing under absolute control. The jerk and grab is gone and you spot your load without fighting the levers. There is no lost time, no lost motion, and adjustment, when required, is quick and easy.

Northwest Uniform Pressure Swing Clutches can make money in the heart of the job where profits begin. They are among the many Northwest advantages to be considered when you plan for that next Shovel or Crane.

Let us send you the full details on the size machine you need.

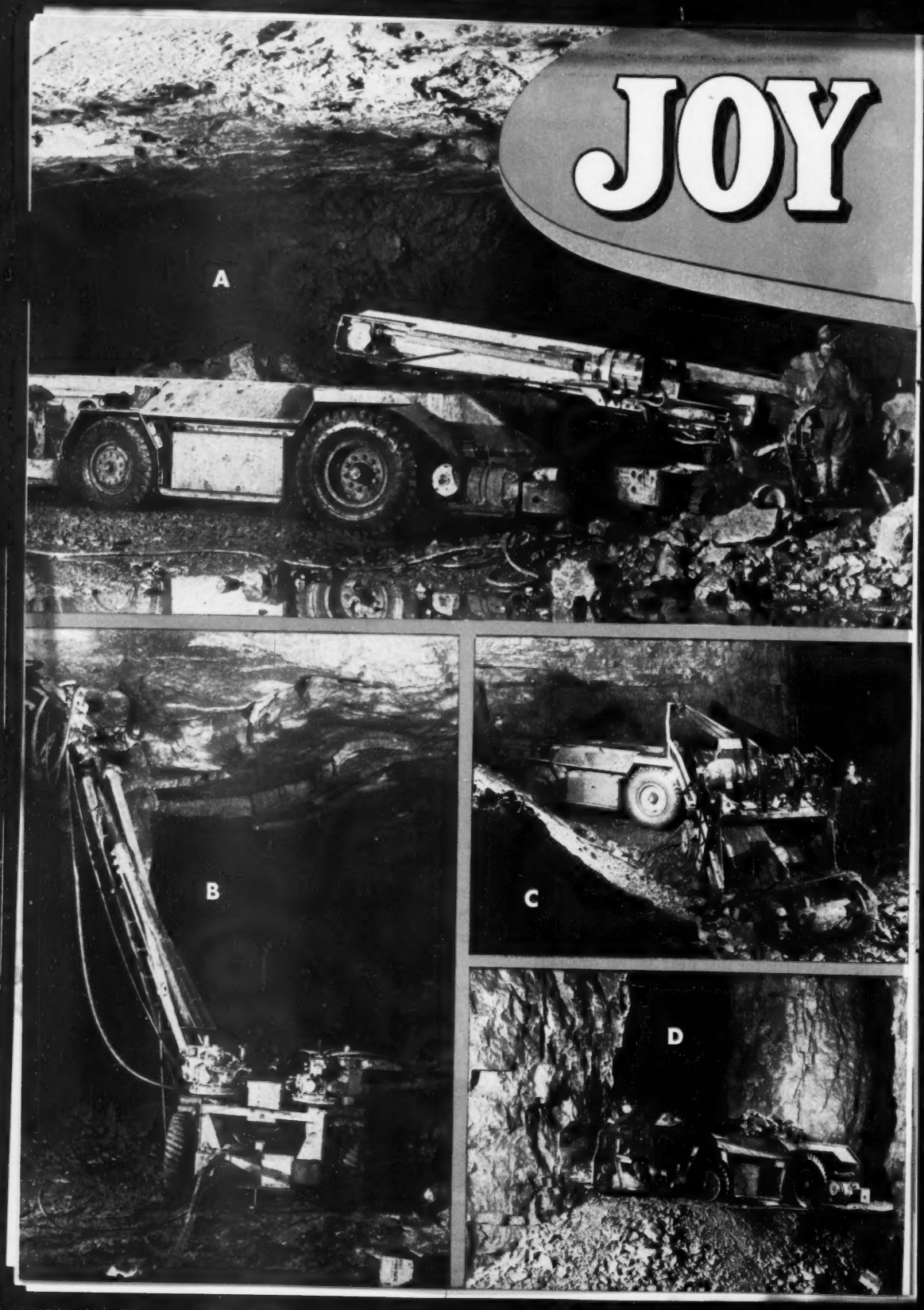
NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South LaSalle Street
Chicago 3, Illinois

NORTHWEST ADVANTAGES cut loading costs



NORTHWEST

Convertible for any Mining, Material Handling or Excavation Problem


JOY
A
B
C
D

MECHANIZED EQUIPMENT

reduces costs—increases tonnage

. . . does the DRILLING, LOADING and HAULING JOBS with TOP EFFICIENCY

JOY DRILLMOBILES

In photograph B on the facing page, the long reach of a JOY Drillmobile is being utilized in taking down back. These rubber-tired, self-propelled, twin-boom units are setting new standards of fast, low-cost drilling in modern trackless mining, both in the metal and non-metallic fields. JOY Drillmobiles are fast-tramming, highly maneuverable machines, available in three sizes for work in any size heading or in stopes where the grade is not too steep. Drills can be equipped with long feed or standard drifter cradles and are mounted on JOY Hydro Drill Jibs, which make hole-positioning easy and accurate, and permit remote control for maximum safety. ● *Write for Bulletin 87-F.*

JOY 18-HR-2 LOADERS

Photograph A at the top of the page at left shows a JOY high capacity, continuous-type Hard Rock Loader in operation, loading into a JOY Shuttle Car in one of the mines of the Southeast Missouri Lead Belt. This heavy-duty, crawler-mounted machine loads up to 12 tons per minute, producing high tonnage at low cost in trackless mining. It is ruggedly built to handle hard and abrasive rock and ores. The JOY gathering mechanism (not shown in the picture) assures top efficiency, and the chain conveyor swings 45° to either side of center to meet various loading requirements. A smaller model, the JOY 17-HR Loader, is built for use in more restricted areas. ● *Write for Bulletin J-108.*

JOY SHUTTLE CARS

The versatility and flexibility of JOY Shuttle Cars in metal and non-metallic trackless mines is well illustrated by the photographs on the opposite page. In photos A and C, JOY Model 60 Shuttle Cars are shown being loaded by a JOY Hard Rock Loader and a scraper, respectively; and in photograph D, a car is shown making fill. JOY Model 60 Shuttle Cars (up to 14 tons capacity) are designed to give you rapid and low-cost transferring of rock and ore from loading points to main haulage systems. They are ruggedly-built, fast-tramming cars, with conveyor bottoms to speed loading and unloading and are available with hydraulic cable reel, trolley or diesel drive to suit operating conditions. ● *Write for Bulletin J-200.*

JOY SLUSHERS

In photograph C on the facing page, a JOY electric motor-operated three-drum Slusher is shown mounted over a scraper ramp, which in turn is mounted on a JOY Drillmobile chassis for easy maneuverability in a Southeast Missouri mine. JOY Slushers are available in a full range of two and three-drum models, including air or electric-powered types, adaptable for automatic or remote control if desired and built for heavy duty with low maintenance. Allied JOY equipment includes a complete line of air, electric or gasoline engine-powered single-drum Hoists, Air Motors and Winches, Carpullers and Ropepullers, Sheave Blocks and Scrapers. ● *Write for Bulletin 76-Y on JOY Slushers and Bulletin 76-X on JOY Hoists.*

Consult a Joy Engineer

W&D M3303

JOY MANUFACTURING COMPANY

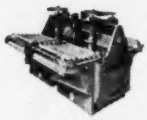
GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

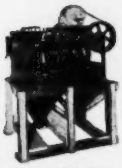
Denver Steel-Head Ball Mills

Denver-Dillon Vibrating Screens

Denver Jaw Crushers

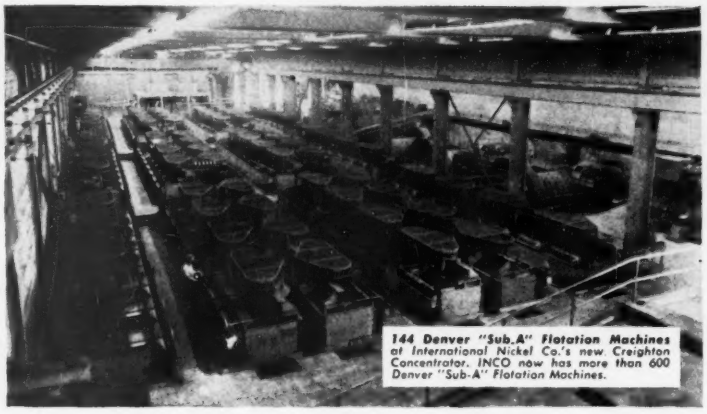


Denver "Sub-A" Flotation



Denver Selective Mineral Jigs

Denver SRL Pumps



144 Denver "Sub-A" Flotation Machines at International Nickel Co.'s new Creighton Concentrator. INCO now has more than 600 Denver "Sub-A" Flotation Machines.

Denver Super-Agitator and Conditioners

Denver Disc Filters

Denver Wilfley Tables

Denver Hydroclassifiers

Denver-Buckman Concentrators

DENVER "SUB-A" Flotation Machines Used in NEW CREIGHTON MILL

Denver Dry Reagent Feeder

144 DENVER "SUB-A" FLOTATION MACHINES were recently installed in International Nickel's new Concentrator at Creighton Mine, near Sudbury, Ontario, which has 10,000 tons daily capacity.

Some of the many factors this mining company considered before installation were:

- ***Machine and installation costs***
- ***Rougher flotation efficiency***
- ***Ability to handle coarse feed***
- ***Capacity and horsepower requirements***
- ***Consumption of reagents...wearing parts***
- ***Simplicity and cost of operation***

THE NET RESULT—and it is the NET RESULT that means additional production and profits—was in favor of DENVER "Sub-A" FLOTATION! International Nickel's decision—based on FACTS—has resulted in many repeat orders. They now have nearly 500 No. 30 (56 x 56) and more than 100 smaller Denver "Sub-A" Flotation Cells.

MANY are CHANGING to DENVER "SUB-A" FLOTATION Denver "Sub-A's" are still available. Even with today's increased demand our deliveries are still good. The many operations now changing to Denver "Sub-A" Flotation are proof that no mill can afford to be satisfied with less than Denver "Sub-A" efficiency.

PLEASE DO THIS If you are expanding production, planning a new mill or modernizing your flotation section don't risk the most important point in mill operation—PROFIT! Install Denver "Sub-A" Flotation for roughing, for cleaning—for simple, dependable, efficient operation and the greatest NET PROFIT to YOU.

Denver Vertical Sand Pump

Denver Thickeners

Denver Hydraulic Classifiers

Denver Crushing Rolls

Our 25th Year of Flotation Engineering

Denver Standard Dryers

Complete Mill Equipment from Testing to Feeder to Dryer

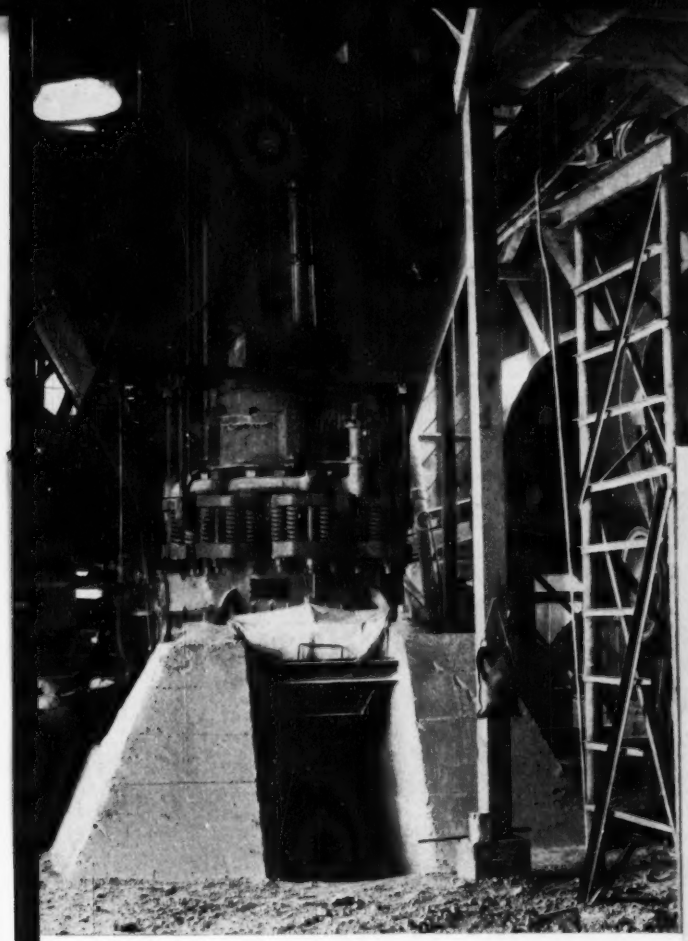
Many of our machines are in stock.

Denver Visual Sampler

Denver Ore Testing Service

DENVER • NEW YORK • CHICAGO • EL PASO • VANCOUVER • TORONTO • MEXICO D.F. • LONDON • JOHANNESBURG • RICHMOND

DENVER EQUIPMENT COMPANY • 1406 17th St., Denver, Colorado



D397 Electric Set Powers Perlite Mill

Perlite is a crushed volcanic rock product that can be "popped" like corn and is used as an insulating material.

At the perlite mine operated by F. E. Schundler & Co., Inc., near North Agua, New Mexico, the source of all power for the crushing mill is a "Caterpillar" D397 Diesel Electric Set. Equipped with air starting, the unit generates 314 kw. in steady, 12-hour service. The current it produces drives electric motors that deliver over 200 hp. to operate the various types of machinery in the mill.

As on many other mining jobs, the heavy-duty D397 is proving the value of ample power coupled with sturdy "Caterpillar" dependability. It performs equally well in dusty conditions, in heat or cold, or at high altitudes.

In these times, national defense demands that you give good equipment extra care. "Caterpillar" machines are built for long, tough service. But a few minutes spent on proper maintenance each day will pay off in many added hours of trouble-free work life. Consult your "Caterpillar" Dealer. He's there to help you. Make the most of all he has to offer.

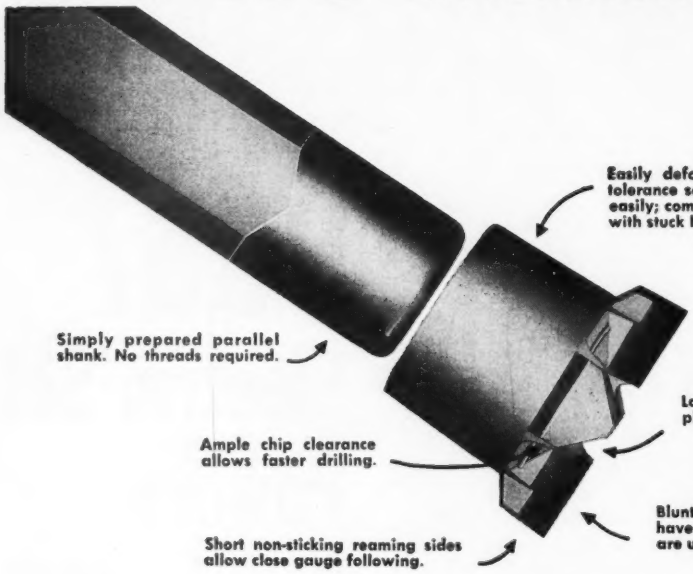
CATERPILLAR, PEORIA, ILLINOIS

A "Cat" D397 Electric Set powers F. E. Schundler & Co.'s perlite mill near North Agua, New Mexico. The company also owns a "Cat" D7 Tractor and a Gardner-Denver compressor powered by a D13000 Engine.

CATERPILLAR
REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

THROWAWAY


Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no lost time with stuck bits.
Simply prepared parallel shank. No threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency — are uniformly hard.
Short non-sticking reaming sides allow close gauge following.

LOWER YOUR DRILLING COSTS
with
SMALLER HOLES AND FASTER DRILLING

Bottom with 1¼" Hole

Save Powder and Steel

DISTRIBUTORS

Bonne Terre Farming & Cattle Co.
Bonne Terre, Missouri

Creative Engineering
825 1st National Bank Bldg.,
Denver, Colo.

THE "TEST" WILL PROVE ITS WORTH

THROWAWAY BIT CORPORATION

4200 N.W. Yeon Ave. Portland, Oregon, U.S.A.

Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

Some territories still open for distributors and jobbers.

Another Record Setting Conveyor Belt—G.T.M. Designed

FIRST long-center underground conveyor in South Africa, this conveyor belt hauls diamond-bearing clay 1,530 feet below the surface of the ground.

Designed by the G.T.M.—Goodyear Technical Man—this belt has proved *so satisfactory since its installation in 1948 that mine management decided to replace other steel-rope haulage systems with conveyor belts!*

Thanks to the results experienced with the G.T.M.-designed belt, operators of the mine now specify Goodyear belting 100% for all conveyors, above ground and below.

Reasons for this decision are:

Elimination of frequent derailments, high accident rate and constant breakdowns experienced with rope-and-cart haulage

Saving of 800 man-hours per day over previous system

Appreciably reduced cost-per-ton-handled

LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR *in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls, built to the world's highest standard of quality.*

GOODYEAR

THE GREATEST NAME IN RUBBER

BUILDING FURNACES?

LOW HEAT CAPACITY is an inherent property of ALFRAX BI aluminum oxide refractory. It's literally made of bubbles — hollow spheres of Al_2O_3, specially bonded together. It has good load strength, is an exceptional insulating material for jobs over 3000F. Also available as a castable cement. Just mix with water and handle like Portland cement.

SHORT ON

here's help

How to keep shortages of certain critical alloys and refractories from delaying furnace construction.

For want of certain scarce heat resisting metals or special duty refractories, many furnaces nowadays get nine-tenths built . . . then wait for the scarce materials. Surprisingly often, this delay could be avoided by substituting our Super Refractories. These materials *are available.* They do have the properties needed. And they'll generally outperform the metals or refractories they replace, *at a lower final cost.*

Consider metals, for example — how do Super Refractories compare? To begin with, they are generally very strong. (The

Use Super Refractories by

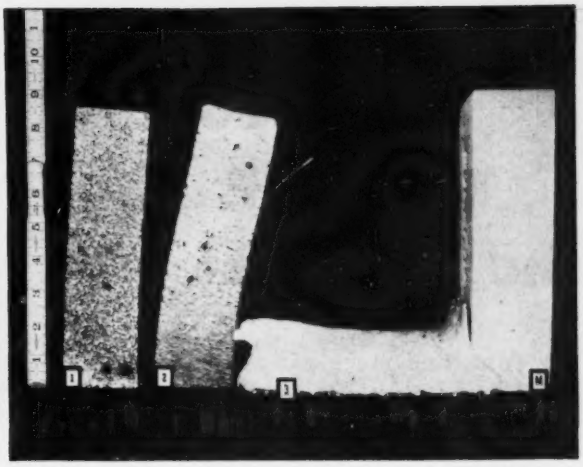
CARBORUNDUM

Trade Mark

Refractories Division — The Carborundum Company, Perth Amboy, N. J.

"Carborundum", "Carbofrax", "Mullfrax" and "Alfrax" are registered trademarks which indicate manufacture by The Carborundum Co.

ALLOY REPLACEMENT is an important function of our CARBOFRAX silicon carbide refractories. These unusual materials often double for furnace parts made of chrome, nickel or cobalt alloys, such as skid rails, muffles, roller hearths, radiant tubes, brazing fixtures, etc. They not only outlast metals, but can also increase the capacity of your equipment.



MULLITE refractories of certain types are often hard to get. However, the purest of the mullites — MULLFRAX electric furnace mullite — is still available. Made by melting together exact proportions of high purity raw materials, it is an entirely synthetic product. Hence, it is purer and more refractory than mullite obtained from natural sillimanite. Note, in the test above — five hours at 3000F — that the MULLFRAX brick ("M") is the only one of these four commonly used refractories, untouched by the heat.

MATERIALS?

modulus of rupture of one Super Refractory averages 3100 psi at 2460F). Most important, they *retain their strength* at temperatures where metals are unusable. All Super Refractories can be safely used considerably above 2800F, whereas 25-12 chrome-nickel steel loses strength rapidly over 1500F, is unsafe over about 2100F.

Some Super Refractories are also more resistant to abrasion than metals, particularly at furnace temperatures. In fact, they are the *toughest known materials* for large scale use. Super Refractory hearths, skid rails, etc. distinctly outwear their alloy counterparts.

Muffles, hearths, radiant tubes and other indirect-heating furnace parts, which must transfer heat rapidly, are often made of Super Refractories. *One Super Refractory conducts heat almost as rapidly as chrome nickel steels!*

You'll find our Super Refractories, too, where chemical attack is severe. They're used in muriatic acid furnaces, hydrogen cyanide converters — even as spray nozzles for sulfuric acid.

There's another Super Refractory that has good insulating quality, particularly at temperatures over 3000F. This material makes an excellent low-heat-capacity lining, for either facing or backing up purposes.

In fact, for practically any combination of furnace conditions — high heat, heat shock, flame impingement, etc. — there's usually a Super Refractory to fit the job . . . and do it better. So don't wait until scarce materials get scarcer. Check up on Super Refractories now. Remember, it's not the first, but the *last cost* that counts — and an unfinished furnace becomes increasingly costly. Write or call us today.

Practically all Super Refractories are available as cements, bricks, or special shapes moulded to close tolerances — including fitted joints, tubes, etc. Information is available on the principal properties of all major compositions. Just send the coupon for our free booklet.

Dept. U-52
Refractories Div., The Carborundum Co.
Perth Amboy, New Jersey

Please send your free booklet on properties of Super Refractories.

Name_____

Position_____

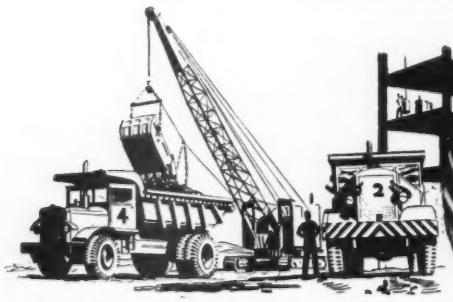
Company_____

Street_____

They Cut Tire Costs on the Toughest Jobs

MORE and more pit and quarry operators use these high-stamina Goodyears to cut their tire costs—because these great tires are designed specifically to give maximum performance on particular types of hauling. And because they handle these tough pit and quarry hauls better, last longer, and deliver lower costs when the figures are totaled up — these Goodyears are first choice with cost-wise operators. Experience will show you, too, that it pays to BUY and SPECIFY Goodyear.

Road Lug—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



ROAD LUG

Dual-purpose tire operates both OFF and ON the road. Combines off-the-road toughness and traction with on-the-road mileage and economy.

HARD ROCK RIB

Companion tire for front wheels in rock work—easier steering, smooth rolling, same cord body, same shoulder and sidewall as the Hard Rock Lug.

HARD ROCK LUG

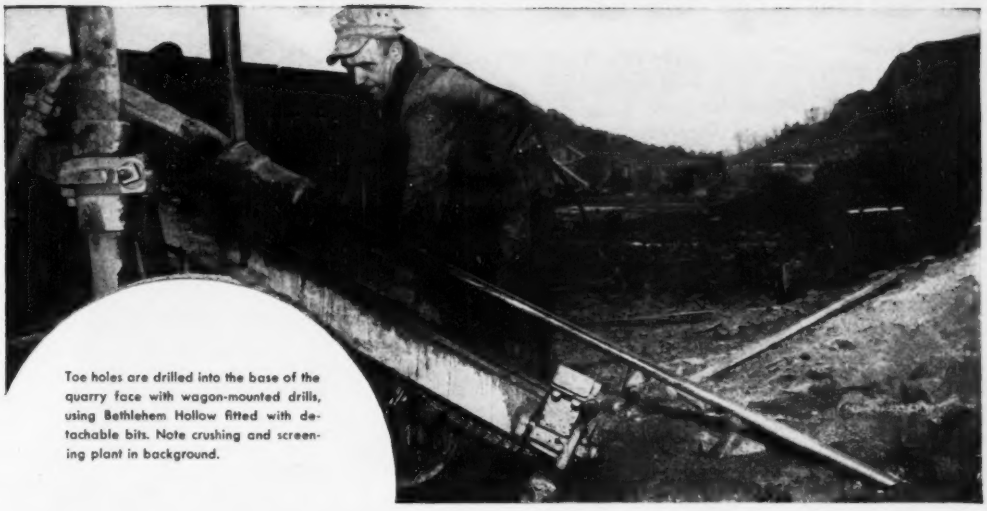
Super-tough champ for all types of rock work. Its armored body and extra-heavy lugs assure longer wear, better performance, even in the toughest going.

That's why

MORE TONS ARE HAULED ON

GOODYEAR

TIRES THAN ON ANY OTHER KIND



Toe holes are drilled into the base of the quarry face with wagon-mounted drills, using Bethlehem Hollow fitted with detachable bits. Note crushing and screening plant in background.

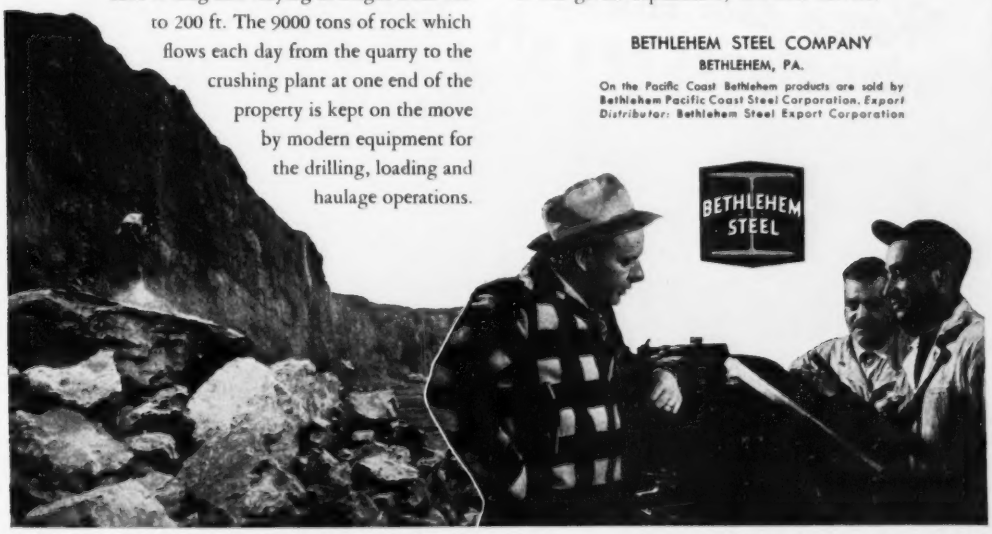
Quarry Producing 9000 Tons Trap Rock Daily Relies on Bethlehem Hollow Drill Steel

The largest quarrying operation in New Jersey is the Chimney Rock plant of the North Jersey Quarry Co., near Bound Brook. Operated on a large scale for about twenty years, the vast pit now has a working face about 1800 ft long and varying in height from 125 to 200 ft. The 9000 tons of rock which flows each day from the quarry to the crushing plant at one end of the property is kept on the move by modern equipment for the drilling, loading and haulage operations.

The rock at this quarry is a basalt, relatively difficult to drill. And like so many stone producers, this company has long relied exclusively on Bethlehem Hollow Drill Steel. Used in both wagon drills and jackhammers, it has given dependable, low-cost service.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



Blocks of trap rock which are too large for shovels to handle are drilled with jackhammers, then broken with small charges of explosive. The height of the quarry face ranges up to 200 ft.

Proper reconditioning of drill steel is an important function of the central shop operated by North Jersey Quarry Co. at Summit, N. J.

Can your rear-dump

Stripping bauxite in Surinam, Billiton Mines replaced their railroad network with 9 Tournarockers. In spite of 10% grades, extreme heat, and 120" annual rainfall, each unit delivers 150 cu. yds. of overburden hourly on 750' hauls.

Here's how these advantages pay off

Try one, buy two in California

Monolith Portland Cement Co. rented a Tournarocker for their mountain-face limestone quarry at Monolith. Its maneuverability over winding mountain roads, in restricted load and dump areas, and its output were so satisfactory the company bought *both* the first unit *and* another. The 2 Tournarockers now deliver 160 tons hourly on 400' cycles, all the shovel can dig.

Boosts output in Pennsylvania

Loaded with 15 yds. of clay, Tournarocker hauls 700' up 10% grades, 820' up 4%... strips 120 yards hourly for J. Robert Bazley, Inc. at their Mt. Carmel, Pa., mine. 4200' cycle is completed in 7.4 min. . . . smaller trucks take 7.9 min. for same trip. "We're particularly impressed with Tournarocker's clean dump and its safety when rear wheels are over bank," says Owner Bazley.

LeTOURNEAU LET EQUIPMENT

R. G. LeTOURNEAU, INC., Peoria, Illinois

HIGH-SPEED, RUBBER-TIRED EXCAVATING • HAULING • LIFTING EQUIPMENT

haulers compare with C TOURNAROCKERS ?

Turn around in a 13′ 9″ radius

When Tournarockers work a-cramped rock job, there's no time wasted "backing all over the place" to load or dump. Because of its 2-wheel prime mover and positive-power electric steer, 18-ton Tournarocker turns in any footing within 13′ 9″ radius (less than half the rig's 29′ overall length), is ideal unit for work in restrictive quarters.

Eliminate tire breakage in rough going

Tournarocker load is carried by four 21.00 x 25 low-pressure tires. These big tires reduce rolling resistance of duals . . . are bigger, heavier, stronger than duals . . . better adapted to withstand load and haul shocks. They have no divided face to wedge in rock fragments that wear and tear. They roll easily over rocks that might concentrate entire load on one or the other of the lighter duals, and result in bruising or breaking the fabric.

Absorb punishment without costly repairs

Tournarocker's 3-ply, steel-grid bowl resists damage normally done when big-chunk rock is loaded. As a result, most welding and patching is eliminated. In addition, because Tournarockers have no frame, sub-frame, springs, spring hangers, drive shaft, front steering wheels or hydraulic system, many trouble spots are eliminated . . . spare part requirements reduced . . . maintenance costs kept down.

Work and turn on steep grades in safety

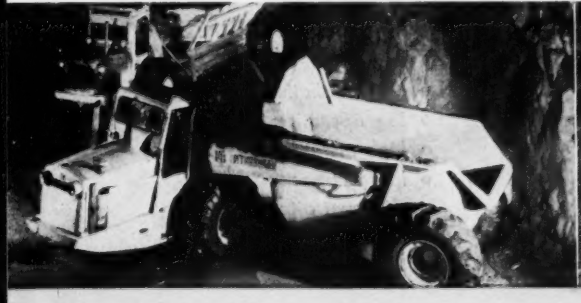
With positive power steer, and instant electric controls, and 4-wheel, multiple-disc air brakes (3763 sq. in. total braking surface, more than 4 times that of other haulers), loaded Tournarocker may be driven at high speeds down narrow, steep winding haul roads with complete safety.

Drive anywhere . . . dump safely over bank

Power-proportioning differential (which delivers up to 4 times the power to drive wheel on firmest footing) — plus the extra flotation and traction of giant tires — get rig through footing that stops conventional haulers. In addition, because it has power on front wheels, Tournarocker backs safely to edge of fill, dumps load clear over bank . . . eliminates most dozer clean-up.

Interchangeable for further profits

For other jobs, you can easily interchange the 186 h.p. C Tournarocker prime mover with 4 auxiliary hauled units . . . 14-yd. Carryall Scraper, 18-yd. bottom-dump hauler, flat-bed, and 15-ton crane. Other Tournarockers (9, 35 and 50-ton) may also be interchanged with similar trailing units, each costing about 25% of original unit price. Prime mover change takes only a few hours. This equipment travels via highway or cross-country to their assignments. Ask your LeTourneau dealer for full details.



Whips tight quarters in Sweden

Svenska Vag Akt. and Nya Asfalt Akt. are nearing completion of a 785,000-yd. 36′ wide, 40′ high, and 2.9-mi. long underground tail-race tunnel in Gavleborgs Province. "Our Tournarocker is superior to other units," says Chief Project Engineer S. Westby. "Its greatest advantage is its maneuverability and 13′ 9″ turning radius."

Licks 10% grades in Arizona

Two 35-ton Tournarockers, stripping overburden for Bagdad Copper Corporation at Bagdad, Arizona haul loads, which by actual weight tests, average 37½ tons each. Time for each 4500′ cycle—including 2 min. to load, and 4½ min. to haul 2250′ (half of the distance up 10% grades) averages only 11.2 minutes. Dump time varies from 35 to 40 seconds.

122 or 186 h.p. TOURNADOZER*

14-yd., 18-ton TOURNAPULL*

18-yd., bottom-dump TOURNAHOPPER**

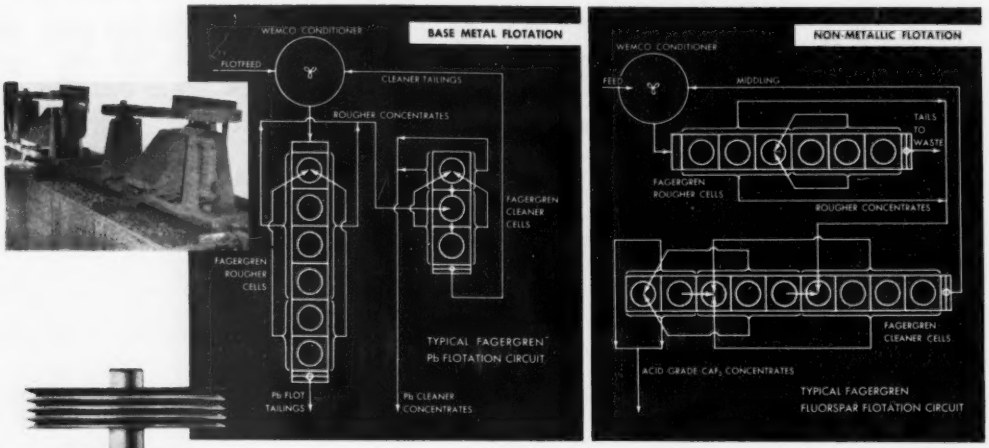
20-ton, flat-bed TOURNAHAULER**

15-ton lift TOURNACRANE*

** Trademark

* Trademark Reg. U. S. Pat. Off.

These Flotation Flowsheets prove it!



FAGERGRENS give greater flexibility of cell arrangement!

These typical flowplans demonstrate the outstanding features of WEMCO's Fagergren Flotation machine: flexibility of cell arrangement. Fagergren cells are arranged for product transfer by gravity flow, on one floor level and **without the use of auxiliary pumping equipment.**

In medium size and small circuits, Fagergrens provide high metallurgical efficiency in cleaner, recleaner and rougher operations by recirculation of flotation products. This efficiency and the unequaled flexibility of cell arrangement give you these seven advantages:

- *low installation cost*
- *low operating cost*
- *high metallurgical efficiency*
- *large capacity*
- *minimum attendance*
- *minimum maintenance*
- *low reagent cost*

Write today for further information on how Fagergren flexibility can improve your flotation results.

OTHER **WEMCO** PRODUCTS

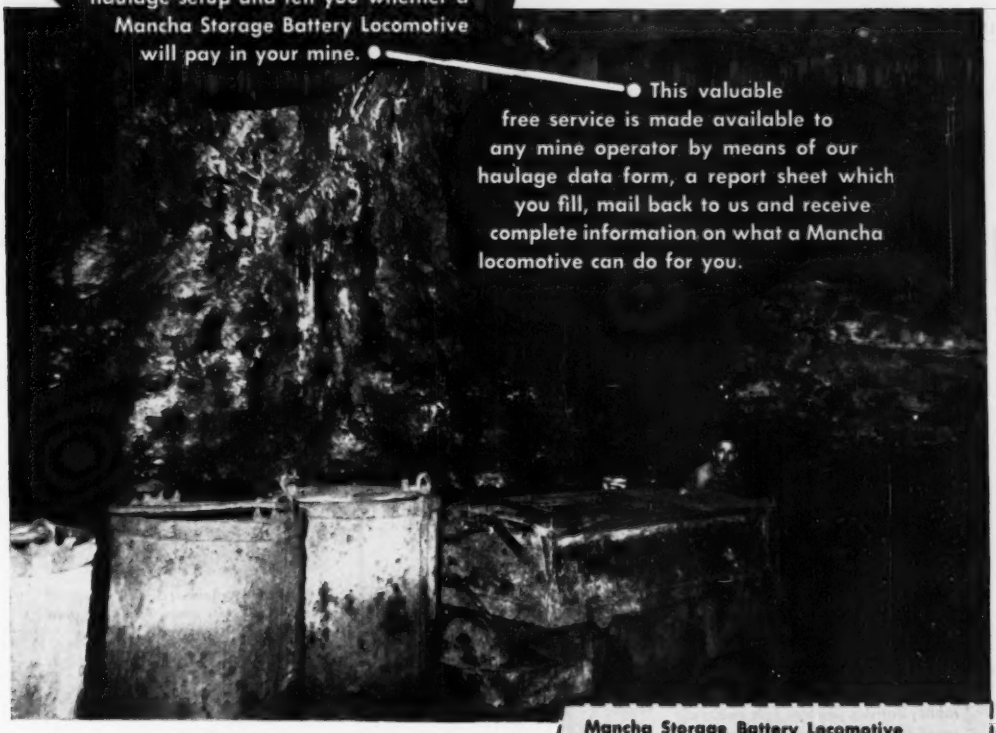
Mobil-Mills • Coal Spirals • HMS Thickeners
HMS Pumps • Densifiers • Cone Separators
Drum Separators • Fagergren Laboratory Units
Fagergren & Steffensen Flotation Machines
Hydroseparators • HMS Laboratory Units
Dewatering Spirals • Agitators • S-H Classifiers
Thickeners • Sand Pumps • Conditioners

WEMCO
WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

You know *in advance* what to expect from a

MANCHA STORAGE BATTERY LOCOMOTIVE

Before you buy — even before you decide to purchase new haulage equipment — Mancha engineers will analyze your haulage setup and tell you whether a Mancha Storage Battery Locomotive will pay in your mine.



This valuable free service is made available to any mine operator by means of our haulage data form, a report sheet which you fill, mail back to us and receive complete information on what a Mancha locomotive can do for you.

Scores of mine operators have gained important haulage economies by taking advantage of Mancha's service. You can do the same without placing yourself under the slightest obligation.

Mail the coupon. Get your mine haulage data form now.

Mancha Storage Battery Locomotive
Division **GOODMAN** *Manufacturing Company*
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ - 552

Send your mine haulage data form.

NAME _____

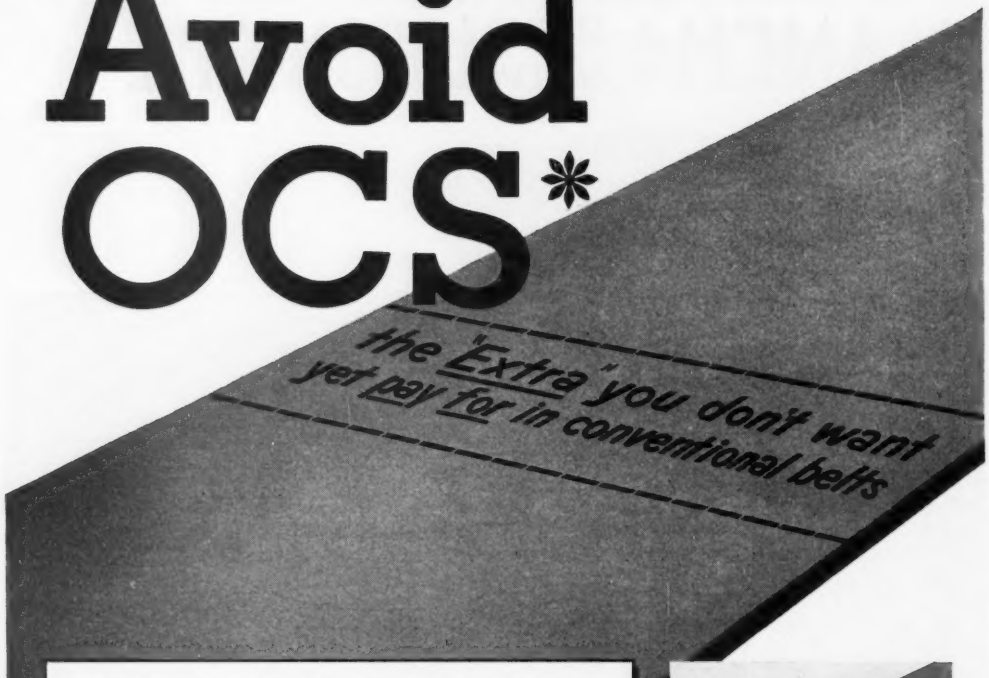
FIRM _____

ADDRESS _____

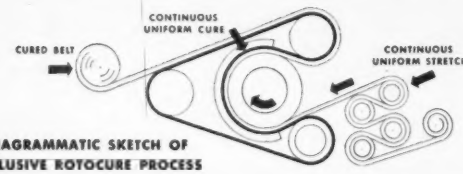
CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

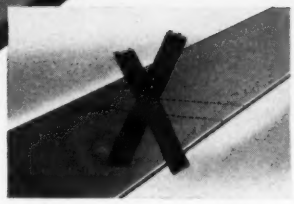
Avoid OCS*



Rotocure eliminates this cause of conveyor belt failure



DIAGRAMMATIC SKETCH OF
EXCLUSIVE ROTOCURE PROCESS



*Overcured Sections — present every 30' to 40' in all belts made by the flat press method.

When you buy a conveyor belt, your money entitles you to a belt *uniformly cured throughout.* But you don't get it, you *can't get it* with belts made by conventional flat press methods!

Here's what happens in flat press curing: belt segments every 30 to 40 feet are overcured because of press overlaps — sections cured earlier advance *less than a full press length.* The "double treatment" results in a series of weakened structures about 2" to 4" wide. They're "breakdown breeders."

You won't find these Achilles heels in BWH *ROTOCURED* CONVEYOR BELTS! They're made by continuous, constant-motion curing. Every inch of the belt receives a uniform, *single* curing. Every inch of the belt is *uniformly strong.*

BWH Rotocured Belts cut the cost per ton of material conveyed because they pay off with the following:

1. **Increased belt life (up to 40%)**
2. **Elimination of mechanical distortion at the press ends**
3. **Constant, uniform stretch**
4. **Uniform, abrasion-resistant covers**

Get the complete story from your BWH distributor who knows a good thing when he sees it — for *you.* Ask him also about BWH Transmission Belts — another cost-cutter because they permit operation at lower tension and belts last longer.

BWH
DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

Pre-testing in Lab ELIMINATES GUESSWORK for Projected Process

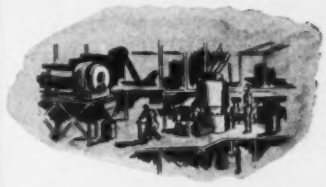
PROBLEM . . .

A mining company wanted to know if lightweight aggregate could be produced profitably from material available in a company-owned shale deposit.

"Can a product be made that will meet commercial aggregate specifications?" And —"Will the process be commercially practical?" The customer wanted answers to these questions before going ahead with full-scale operations.

WHAT WAS DONE . . .

A sample from the shale deposit was sent to the Allis-Chalmers Process Research Laboratory. Tests in the Laboratory's 15-ft rotary kiln and gyratory crusher indicated that the product would meet the highest aggregate standards . . . and that the process would yield a healthy margin of profit.



RESULT . . .

This company was able to set up operations on a commercial scale with the *assurance* that the product would be readily salable . . . and with a complete knowledge of the costs involved.

A-3673

ALLIS-CHALMERS
Research Laboratories

PILOT PLANT FACILITIES ARE AVAILABLE FOR YOUR USE IN . . .

Grinding
Crushing
Concentration
Food, Chemical and Grain Processing
Oil Extraction
Pyro-Processing

The Laboratory's complete facilities for chemical and physical analysis have also been used profitably by hundreds of clients. All testing services include the technological skill of the Laboratory's personnel, who are guided by Allis-Chalmers invaluable experience in engineering equipment for industry.

Testing is done on a confidential basis. Charges are based on costs. Estimates for test work can be obtained from the A-C representative in your area or by writing Allis-Chalmers Research Laboratories, Milwaukee 1, Wis.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Send for Laboratory Bulletin 07B6119B.

Priceless Imperfection

Even without its priceless imperfection, the diamond would still be nature's supreme cutting element. Its billions of atoms are compressed into a perfect crystalline structure which for compactness, hardness, and cutting power is without peer.

Perfect—but for one priceless imperfection. Allied to each cleavage plane is a tough vector or "rib" known to the ancients and to every diamond setter as the world's greatest cutting edge.

It is the aim of all good diamond setters to locate these structures and set them "toward the work" so that the driller can use all of their incomparable cutting power.

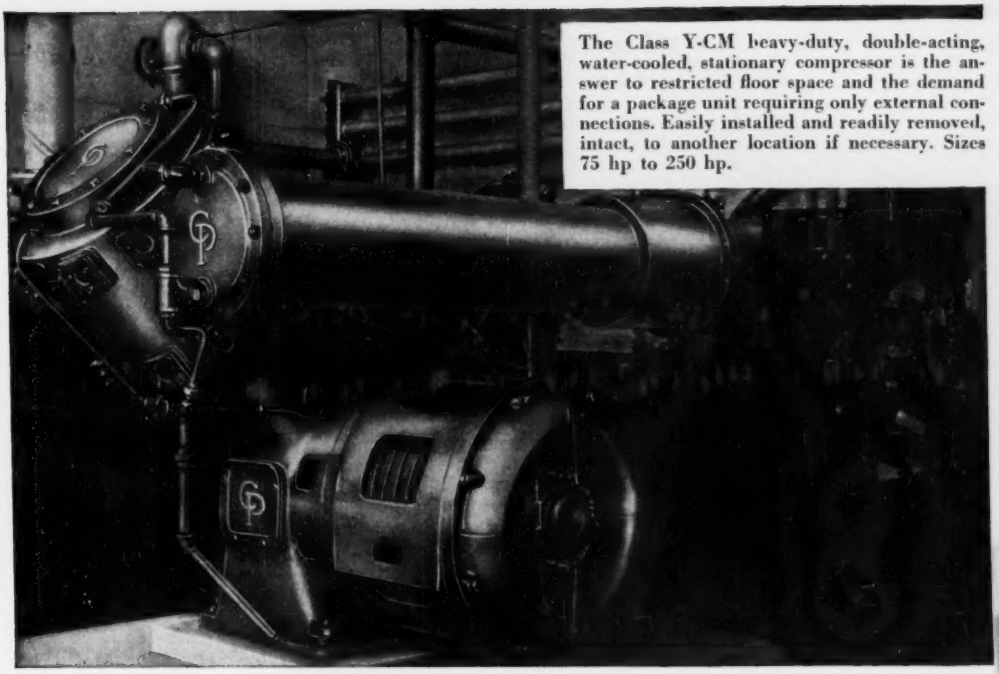
In the manufacture of Truco Diamond Drill Bits, diamonds containing such a visible vector have always been set with this tough fused section toward the work—a major reason why Trucos have always delivered maximum footage at minimum cost.

WHEEL TRUEING TOOL COMPANY

3200 W. DAVISON AVENUE, DETROIT 6, MICHIGAN

WHEEL TRUEING TOOL CO. OF CANADA, LTD.

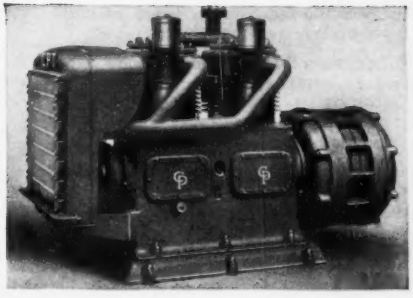
575 LANGLOIS AVENUE, WINDSOR, ONTARIO, CANADA



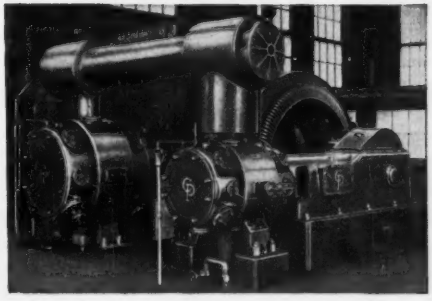
The Class Y-CM heavy-duty, double-acting, water-cooled, stationary compressor is the answer to restricted floor space and the demand for a package unit requiring only external connections. Easily installed and readily removed, intact, to another location if necessary. Sizes 75 hp to 250 hp.

dependable, low maintenance compressors

from 7½ hp to 2000 hp



The small, compact, two-stage Class PM compressor—air-cooled for all-weather operation—may be installed independently of main air system. Also suitable for off-hour operations. Sizes from 25 hp to 100 hp. Available with built-in motor, flexible coupling or V-belt drive.



Built in the larger sizes — up to 2000 hp, Class O-CE horizontal duplex motor-driven compressors meet all load demands most economically, and "last forever."

Write for further information on these and other types of CP Stationary Compressors.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

HANDWORK ON THE ROCK PILE

Missouri lead mine—about 1890. The "ton per day" output of ore separators like this was limited by the stamina of men.

An enlargement of this photo suitable for framing is yours for the asking.

Times Have Changed...

Yesterday's blasting practices are as out-of-date as the hand-jig separator!

It took a lot of muscle to mine ore in the old days! Drilling hard rock with hand steel . . . bringing ore to the surface by hand windlass . . . separating rock with hand jigs was backbreaking labor.

Today, *mechanical* power takes the backbreak out of drilling, hoisting, and milling. What's more, miners at last can take full advantage of the power of explosives to bring out more ore at less cost—with less wear and tear on their machines.

But just as with other mining equipment, the operator must keep up with the latest to get the best—and the latest and best in explosives technique is the Atlas ROCKMASTER System, based on millisecond delay detonators.

With ROCKMASTER blasting, miners now have much greater control over explosives energy . . . more control over breakage, throw, noise, and vibration than ever was possible before. And Atlas is constantly improving the ROCKMASTER Blasting System so that with proper drilling and loading miners can lower explosives costs and yet gain increased production.

Are *your* blasting practices right up to the minute? Better send for the free 20-page booklet on ROCKMASTER blasting.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

the "low down" on grinding

The Marcy low-pulp-line, rapid-circulation-of-mill-content principle of grinding, thru the use of a grate discharge, was first used 38 years ago.

Its wide acceptance has been proved by the universal use of Marcy Grate Discharge Mills and the many repeat orders received based on output and low-cost-per-ton performance.

27—10′ x 10′ Marcy Grate Discharge Mills grinding in excess of 50,000 tons per day in large western copper mill.

For example:

LARGE COPPER CO. GRINDS 50,000 TONS PER DAY WITH MARCYS

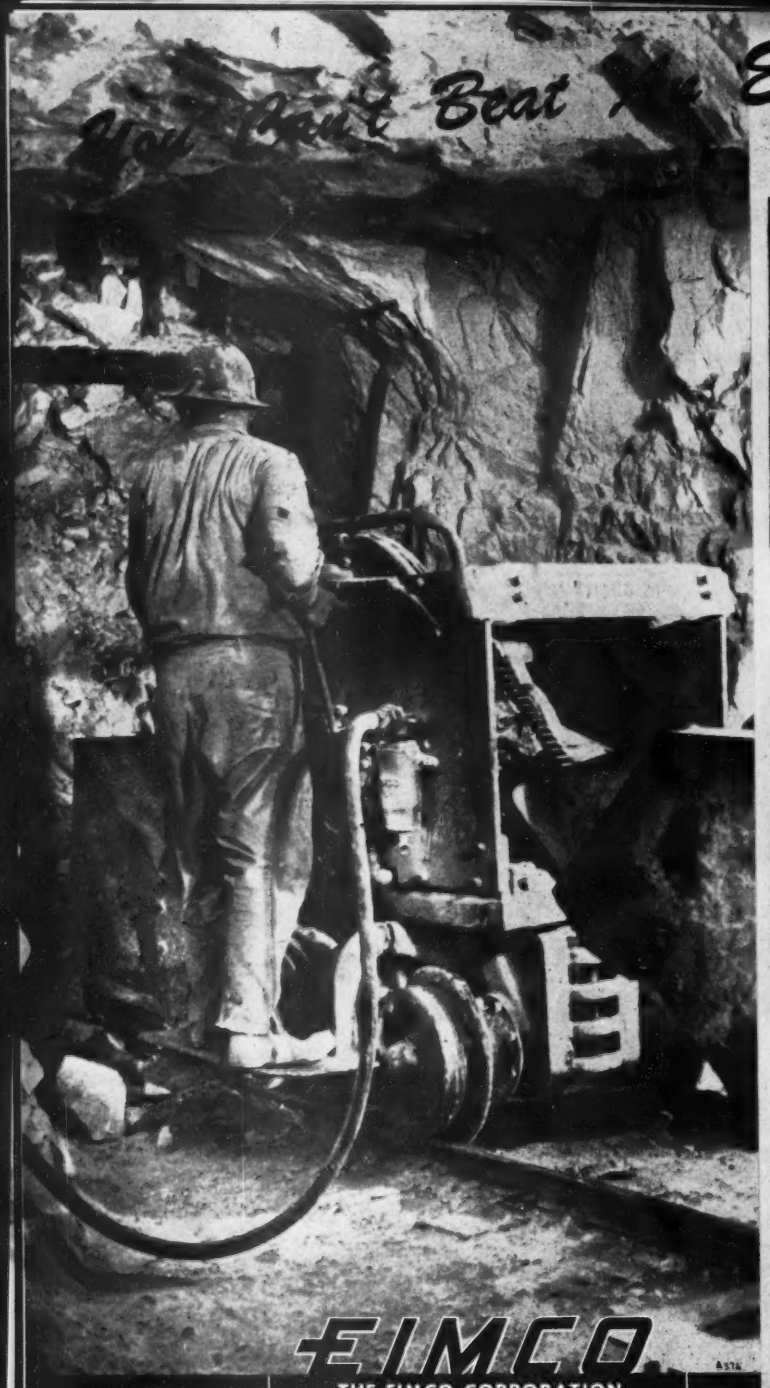
Following extensive tests this large copper company installed 16—10′ x 10′ Marcy Grate Discharge Ball Mills. Two years later, when increased production was required, 11 more 10′ x 10′ Marcys were added. These 27 Marcys are grinding in excess of 50,000 tons per day of medium hard ore to 65 mesh. Based on 10 years proved performance of these mills this same company recently ordered 8 more 10′ x 10′ Marcy Grate Discharge Mills for another mill.

Other MASSCO products: Massco-Fahrenwald Flotation Machines, Genuine Wilfley Tables, Massco-McCarthy Hot Millers, Rock Bit Grinders, Density Controllers, Belt Feeders, Rubber Pinch Valves, Assay and Laboratory Supplies and Equipment, Complete Milling Plants.

The Mine & Smelter Supply Co.

BOX 5270, TERMINAL ANNEX, DENVER, COLO., U.S.A.
OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

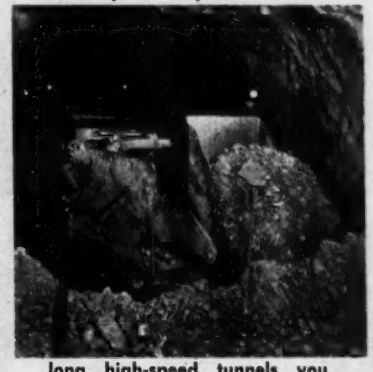
REPRESENTATIVES: CANADIAN VICKERS, LTD., MONTREAL, CAN.; W. R. JUDSON, SANTIAGO, CHILE; THE EDWARD J. NELL CO., MANILA, P.I.; THE AUSTRAL OTIS ENG. CO., LTD., SO. MELBOURNE, AUSTR.; MORGARDSHAMMARS MEK. VERKSTADS AKTIEBOLAG, MORGARDSHAMMAR, SWEDEN; THE ORE & CHEMICAL CORPORATION, 80 BROAD STREET, NEW YORK CITY 4, NEW YORK, REPRESENTATIVES FOR CONTINENTAL EUROPE.



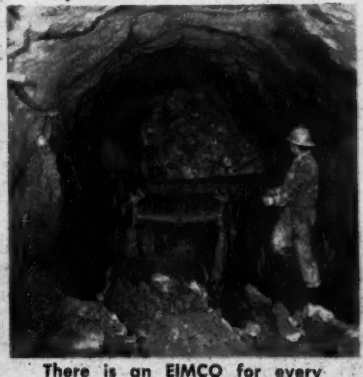
Eimco

The tougher the job the more essential it is that you load with an EIMCO. Loading underground needs the dependability of

equipment that can stand up to the unexpected and keep right on working. On contract jobs you need the speed that EIMCO equipment provides even on "under par" air pressures. On



long high-speed tunnels you need the flexibility of EIMCO equipment to load big cars to capacity. Safe, low-cost loading is yours with EIMCO loaders.



There is an EIMCO for every loading job.

EIMCO

A516

THE EIMCO CORPORATION

The Leader in the Manufacture of Vacuum Filtration Equipment

EXECUTIVE OFFICES AND FACTORIES —SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
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IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

WHAT'S TEAR RESISTANCE TO YOU?

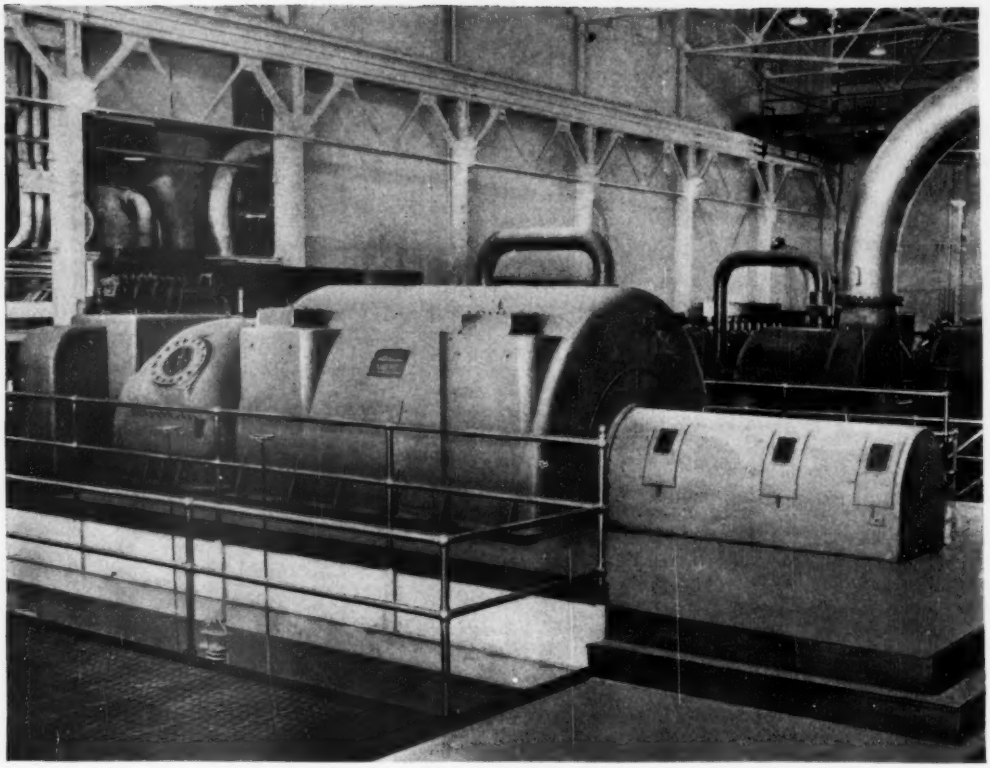
"Tear Resistance" is a term used to indicate the amount of force required to tear the jacket of a portable cord or cable. Most people never give it a thought when they are buying portable cords or cables. Yet despite this lack of attention, tear resistance is a very important quality to have in a cable because it enables the jacket to resist snagging on sharp corners and to resist tearing.

If you expect your cord or cable to stand up under hard service, the jacket must have an adequate amount of tear resistance. TIREX Cords and Cables have this tear resistance to a very high degree. That's why you should always specify and be sure that you get Simplex-TIREX Cords and Cables. They were the original hard service, rubber-jacketed cord or cable made in this country. They have remained the leaders in their field ever since.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

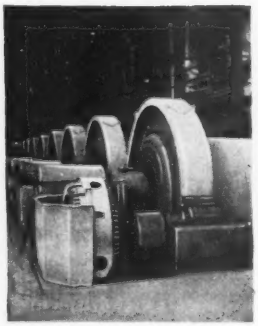
SIMPLEX TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

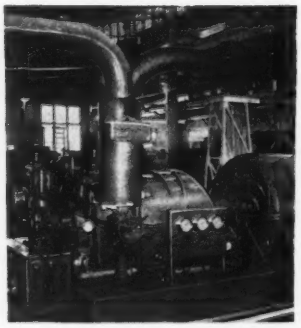


1 **NEW G-E STEAM TURBINE-GENERATOR** generates high-voltage power for this copper company's concentrating and smelting plant. Rated at 10,000 kw, 3600 rpm, the single-stage unit replaces an older 6000-kw unit which generated at 480 volts. Like every G-E turbine-generator, it is custom-built from standard components to meet specific operating conditions.

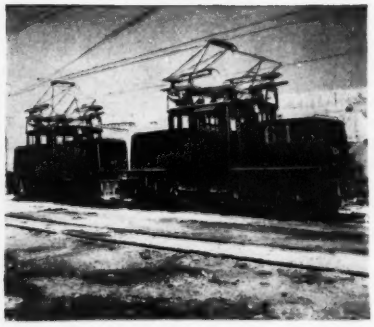
Power system modernized for



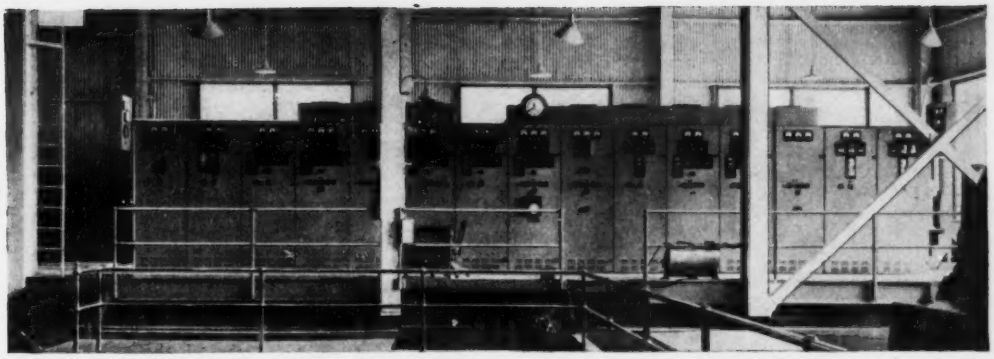
POWER-FACTOR IMPROVEMENT is provided by 28 200-hp synchronous motors driving plant's ball mills.



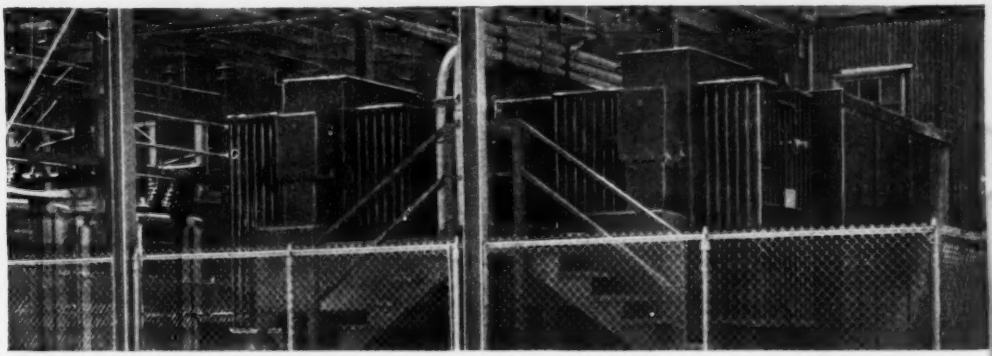
MECHANICAL POWER to drive two turboblowers is generated from process steam by 1915-hp G-E mechanical-drive turbines.



LOW-COST HAULAGE from the copper plant's open pit mine 15 miles away is provided by these two G-E 750-volt 85-ton electric locomotives.



2 **NEW G-E METAL-CLAD SWITCHGEAR** distributes high-voltage power to load-center substations in electrical load areas. These co-ordinated units are shipped completely assembled and ready for installation. Their compact design saves floor space.



3 **NEW G-E LOAD-CENTER SUBSTATIONS,** completely metal-enclosed, step down power from primary voltage to 480-v for use in the ball mill area. High voltage power distribution to load centers reduces voltage drop and cuts power losses.

more efficient distribution

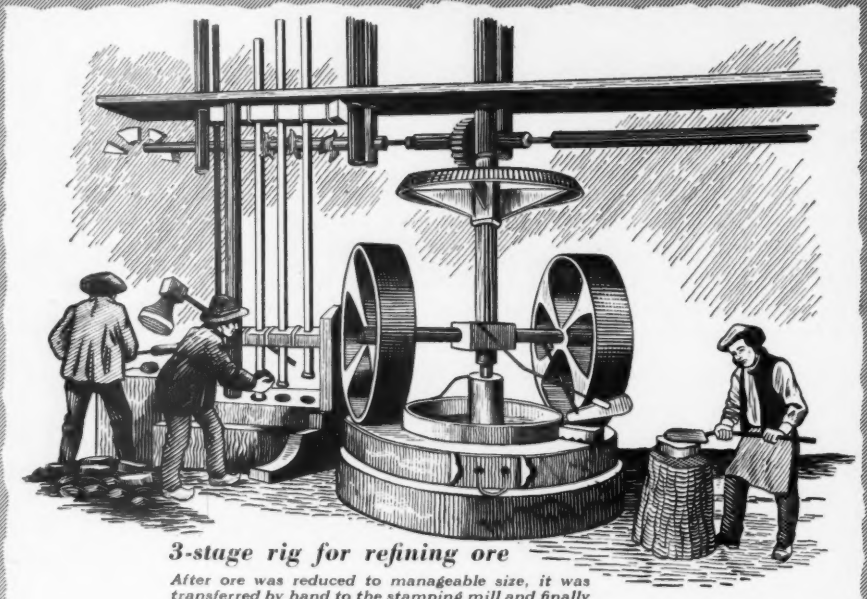
Copper plant increases capacity by adding G-E turbine, switchgear and load-center substations to existing power system

As part of a continuing modernization program at its concentrating and smelting plant, a large copper company in the Southwest recently installed new General Electric high-voltage power generation and distribution equipment. With these new facilities, power is generated and distributed the modern, high-voltage way. Result: increased protection against shutdowns, lower power-distribution cost.

You, too, can benefit from the kind of G-E application engineering that went into this installation. Call your nearest G-E office and ask for a mining specialist. *General Electric Company, Schenectady 5, New York.* 660-25

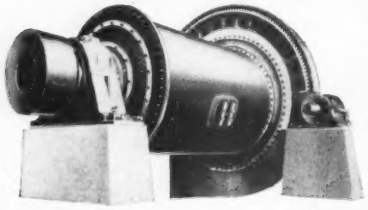
Engineered electric systems for the copper industry

GENERAL ELECTRIC



3-stage rig for refining ore

After ore was reduced to manageable size, it was transferred by hand to the stamping mill and finally ground to powder. Crude as it may seem today, this rig was once the ultimate in production efficiency.



Traylor builds four types of grinding mills in a wide choice of sizes to meet your exact needs.

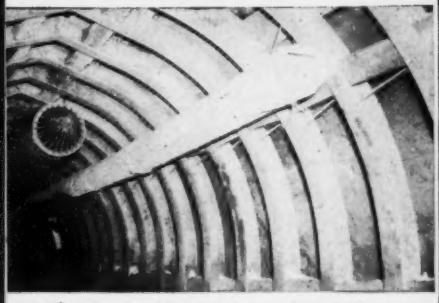
History excitingly illustrates the speed with which our machine age advances. And Traylor is proud of the part it plays in this movement. For 50 years, Traylor has led in developing new designs and producing better machinery for the mining industry. In that time, Traylor equipment has gone all over the world, building a name famous for efficient operation. It takes experience to come up with the right answers consistently. Traylor has experience . . . half a century of it. Use it to your advantage.

OUR GOLDEN ANNIVERSARY YEAR
1902 1952

TRAYLOR ENGINEERING & MANUFACTURING COMPANY
462 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • Los Angeles
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

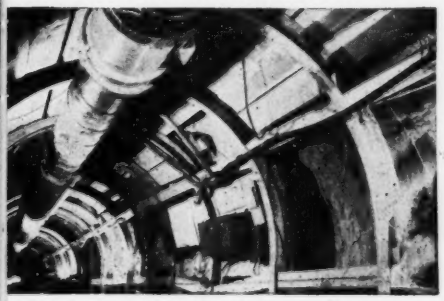
a **Traylor** *leads to greater profits*

Looking toward the face of a Joy-ventilated tunnel one minute after round has been shot.



The same area just ten minutes later (with camera facing opposite direction). Effectiveness of the ventilating system is obvious.

Auxiliary Joy Portable Axivane Blower which furnishes cooling air and dissipates smoke quickly from the face after a round has been shot.



A Joy Series 1000 Axivane Fan mounted in the duct line of the main ventilating system. Note simplicity of installation and economy of space.

FOR TUNNEL-DRIVING OPERATIONS:

Here's how JOY AXIVANE FANS provide better Scavenging and Ventilating

Joy Axivane Fans provide a system of tunnel or mine ventilation that is unmatched for simplicity, ease of installation, economy of space, efficiency of operation and low overall costs.

Series 1000 Fans are *installed right in the duct,* without complicated bends and elbows. They actually become an integral part of the duct line! Additional fans are inserted as needed as the line is extended. (If power is not available throughout the tunnel or mine, Joy Axivane Fans may be gang-mounted in series at the portal with practically no loss of efficiency.) A Joy Axivane Portable Blower can be placed in a short, auxiliary duct that is laid up to the face. After a round has been shot, the fouled air is quickly blown away from the face by the Blower and sucked into the main ventilating system by the Axivane Fans.

Ordinarily, the fans exhaust the stale air through the duct line so that the main body of the tunnel is always filled with fresh air. If rock temperatures are excessive and the drift of air down the tunnel becomes too hot for comfort, the fans can be turned around so that they blow fresh, cool air from the surface, through the duct line, directly to the face.

It's a simple and easy installation—one designed to make maximum use of the inherent advantages of the Joy Axivane Fan. ● Let us show what a simple matter it will be to solve YOUR ventilating problems with Joy Axivane Fans.

Over 100 Years of Engineering Leadership

Consult a Joy Engineer

W&D M 4027

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Front view shows high-voltage receptacle. Door to low-voltage breakers is shown on the side.

Back view shows the four low-voltage receptacles.

LOW-COST MINE POWER CENTER

Here's the low-cost way of carrying high-voltage power to the vicinity of the working face . . . to take full advantage of better regulation, lower line losses. It's the new Westinghouse Power Center, designed for service where nonhazardous conditions exist. One complete package, the unit is contained in a sheet steel case. Because of its economical construction and natural draft air cooling . . . *it costs much less than a totally-sealed unit.*

Small, compact size makes it ideal for lowering into mine shafts. The largest rating, 300 kva, is only 26″ high and 45″ wide. For easy portability, it is mounted on skids and equipped with pulling eyes. A separate dolly with adjustable wheels is available for track haulage.

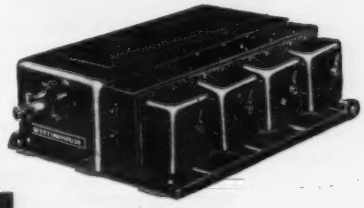
Other important advantages are:

1. Flexibility of voltages . . . from 2400 to 4160 on the primary and 120 to 480 on secondary.
2. Complete and separate protection for each outgoing feeder.
3. Fast disconnection and reconnection of feeders.
4. Safety . . . ground-protective system opens the affected breaker if ground fault occurs.

For complete information contact your nearest Westinghouse representative, or write for Booklet B-4428, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70604

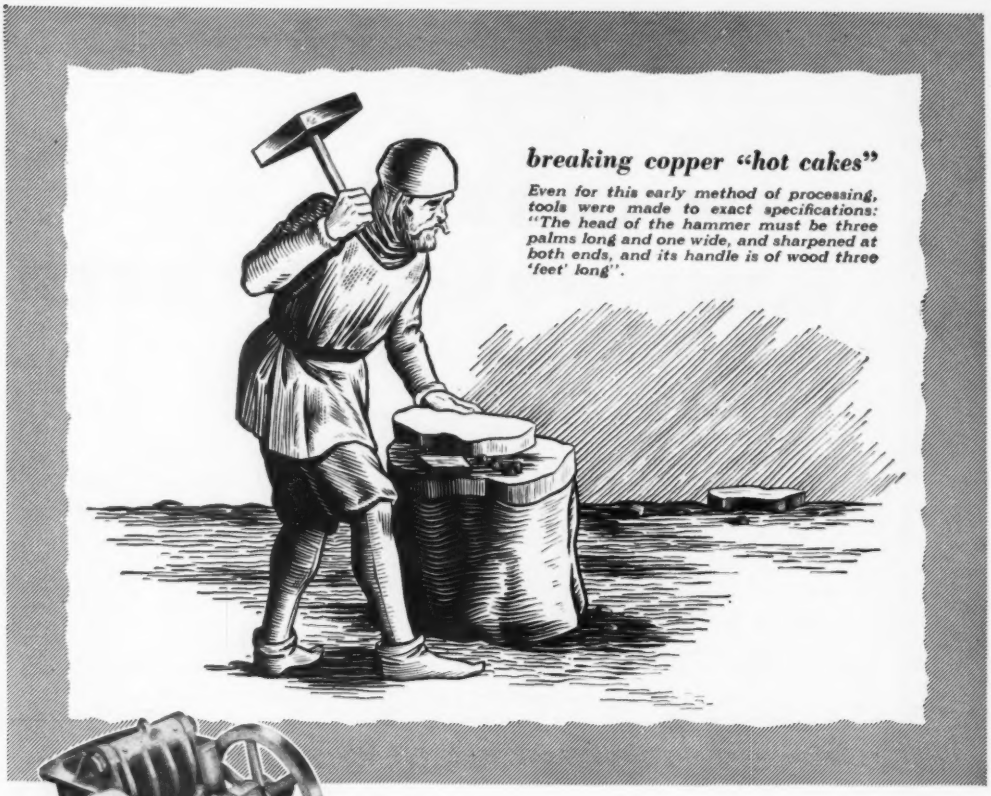
FOR HAZARDOUS CONDITIONS . . .
The Safest Power Center You Can Put in a Mine

This dry-type power center is totally explosion-proof. Comes with basic class C insulation, bonded with silicone . . . core and coils hermetically-sealed in an atmosphere of dry nitrogen.



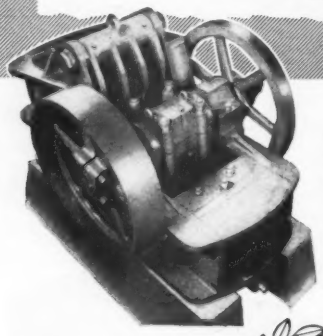
YOU CAN BE SURE . . . IF IT'S
Westinghouse

TRANSFORMER EQUIPMENT



breaking copper "hot cakes"

Even for this early method of processing, tools were made to exact specifications: "The head of the hammer must be three palms long and one wide, and sharpened at both ends, and its handle is of wood three 'feet' long".



No matter how primative, craftsmen have always been particular about the tools of their trade . . . always looking for better equipment, better technique. For 50 years, Traylor has fostered this tradition in the mining industry by the steady development of new and more efficient machinery. When you need crushing equipment, buy machinery backed by a half-century of design and production experience . . . machinery that is traditionally better. Buy Traylor.

16 Traylor H and HB Jaw Crushers offer a wide choice of sizes to meet your exact needs.

OUR GOLDEN ANNIVERSARY YEAR

1902 1952

TRAYLOR ENGINEERING & MANUFACTURING COMPANY

472 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York • Chicago • Los Angeles

Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

a **Traylor** *leads to greater profits*

SAVE MONEY

ON EVERY TRIP

YOUR SCRAPER MAKES

WITH THE GARDNER-DENVER

AIRSLUSHER

HERE'S HOW:

Steady power—for a full pay load every trip.

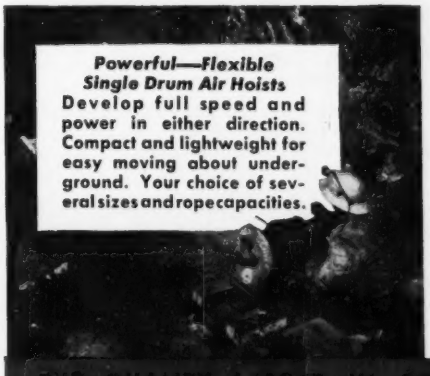
High speed—for more trips per shift.

No air-waste idling between trips.

Single throttle control—readily mastered by your new miners.

Three sizes—to fit your scraper capacity efficiently.

Write today for Bulletin AS-3 on Gardner-Denver Airslushers and Air Hoists.



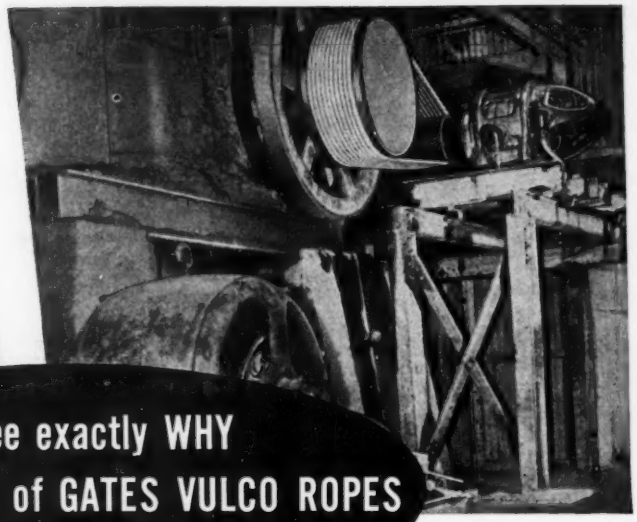
Powerful—Flexible Single Drum Air Hoists
Develop full speed and power in either direction. Compact and lightweight for easy moving about underground. Your choice of several sizes and rope capacities.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada:
Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

A large jaw crusher at the mill of a big copper mine in Sonora, Mexico, is driven by Gates Vulco Ropes. Picture shows the discarded motor still in foreground.



Let's see exactly WHY the Concave Sides of GATES VULCO ROPES mean lower V-Belt Costs!

Every engineer knows how a V-belt *changes shape* when it bends around a pulley.

The top of the belt is under tension—making it grow *narrower.*

The body is under *compression,* causing the sides to bulge out!

Look at figure 1-A in the diagrams, herewith. There you see how a *straight sided* V-belt is forced to bulge in its sheave-groove —and this bulging naturally causes extra wear along the middle of the sides as indicated by the arrows.

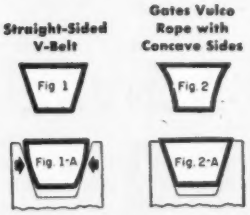
Now look at the figure 2-A. There you see how the precisely engineered Concave Sides fill out to an exact fit in the sheave groove.

Clearly, the Concave Sides press *evenly* against the V-pulley. This means uniform wear; longer life! The Concave Sides have *full traction;* wear longer because of *full contact!*

To sum up: The Concave Sides of Gates Vulco Ropes (U.S. Patent No. 1813698) give you (1) Less wear, (2) More pulley contact, (3) More sure power transmitted when needed!

Only V-belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure you get the V-Belt with the Concave Sides—The Gates Vulco Rope!

What Happens When a V-Belt Bends



How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

CS-521

Gates

Hose V-Belts Molded Rubber Goods for Industry

World's Largest Maker of V-Belts

VULCO ROPE DRIVES

ENGINEERING OFFICES AND JOBBER STOCKS IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY • DENVER • U•S•A

On the *TOUGH* Jobs Operators know

JALLOY HEAT-TREATED PLATES

J&L STEEL

. . . resist impact, abrasion and corrosion

. . . provide longer service life, lower maintenance costs

Cost-conscious mine operators throughout the industry are cutting maintenance and downtime costs by installing tough J&L Jalloy heat-treated steel plates on their equipment.

They've found that on the tough applications heat-treated Jalloy lasts 4 to 20 times longer than mild steel. The reason—Jalloy has the physical properties to resist the severe impact, abrasion and corrosion of mining operations. It is produced with a yield strength of 160,000 lbs. per sq. in. and a Brinell hardness of 341 to 388. The result—Jalloy saves money by cutting steel requirements, reducing downtime for repairs and replacement, and keeping labor costs for maintenance to a minimum.

Here are some of the applications where mine operators are using heat-treated Jalloy—Dump Truck Bottom Liners, Coal, Rock and Ore Chute Liners, Dipper Stick, Shovel and Drag Bucket Reinforcing. You can get Jalloy in bar form and in plates up to 72″ wide and 20′ long with thicknesses from $\frac{3}{16}$″ to $1\frac{1}{2}$″.

Start finding out more about Jalloy today. Just write to Jones & Laughlin Steel Corporation, 412 Jones & Laughlin Building, Pittsburgh 30, Pa. We'll send you a free copy of our booklet, "For Longer Wear . . . Less Repair!" It will give you more complete information on the properties, heat treating and workability of heat-treated Jalloy, the modern mining and quarrying steel.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PA.

We picked this THUMBPRINT out of the air

It's the magnetic signature of a big iron ore body in the eastern United States, recorded with the airborne magnetometer. It points to an important new deposit in an area explored for years by ground parties. We found it in 30 days' flying.

Why did we succeed? Because the air survey works as a vast net, covering every part of an area. There are no gaps. Where ground surveys must follow rivers, streams and access roads, the AERO mapper flies swiftly over any terrain—muskeg, mountain or jungle. The air record is complete; it is more sensitive; and it costs only a few cents per acre.

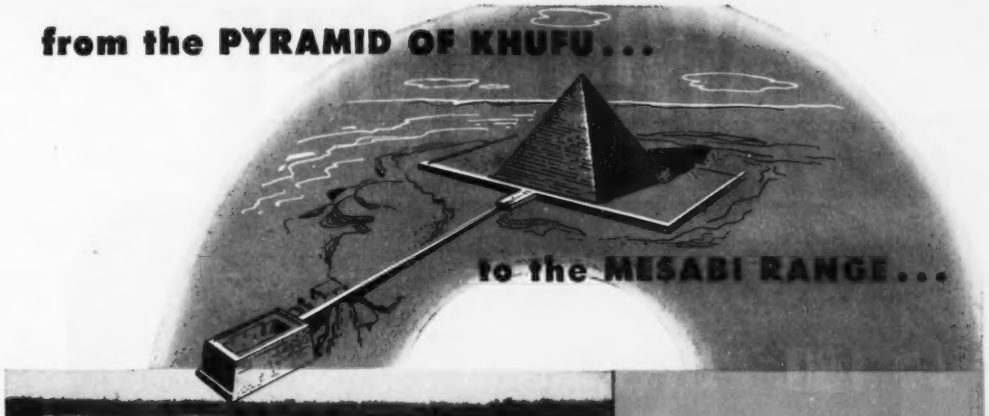
AERO, the pioneer and leader in aeromagnetics, began the first work with this high sensitivity Gulf instrument five years ago. Since then, we have mapped more than 400,000 square miles in successful surveys for chrome, asbestos, magnetite, ilmenite and other minerals.

Call AERO's engineers for more information. We are equipped and staffed to map anywhere for you. In Canada our affiliate is Canadian Aero Service, Ltd., Ottawa.

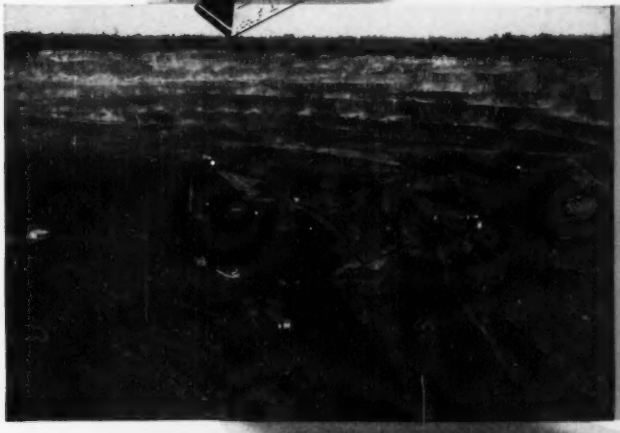
AERO
SERVICE CORPORATION
PHILADELPHIA 20, PENNSYLVANIA
Oldest Flying Corporation in the World

TOPOGRAPHIC MAPS • PLANIMETRIC MAPS • PRECISE AERIAL MOSAICS • AIRBORNE MAGNETOMETER SURVEYS • RELIEF MODELS • COLOR PHOTOGRAPHY

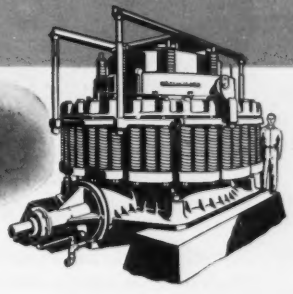
from the PYRAMID OF KHUFU . . .



to the MESABI RANGE . . .



IRON HAS COME A LONG WAY



THE largest of the *Pyramids of Gizeh* is that of *Khufu*, built of limestone cut in the quarries of the Nile Cliffs and floated across the river to the site of the tomb.

It is claimed by some historians that the oldest iron to be discovered was in the form of a tool found in an air shaft of this great pyramid of Khufu, which was built about 2800 B.C. From Khufu to the modern marvel of the Mesabi Range, iron has come a long way . . . to become the metal of greatest service to man.

Since their introduction, "*SYMONS*" Cone Crushers, with their great capacity for more finely crushed ore at lower cost, have been a big factor in the production of iron ore . . . *and have achieved outstanding performance records in all of the great ore and industrial mineral operations the world over.*

NORDBERG MFG. CO., Milwaukee, Wisconsin

® "SYMONS" Cone Crushers . . . *the machines that revolutionized crushing practice* . . . are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to 900 tons per hour.

"SYMONS" . . . A NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

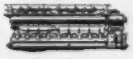
C352

"SYMONS" Primary Crushers

Grinding Mills

Mine Hoists

"SYMONS" Vibrating Bar Grizzlies and Screens



Diesel Engines

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • SPOKANE • WASHINGTON • TORONTO

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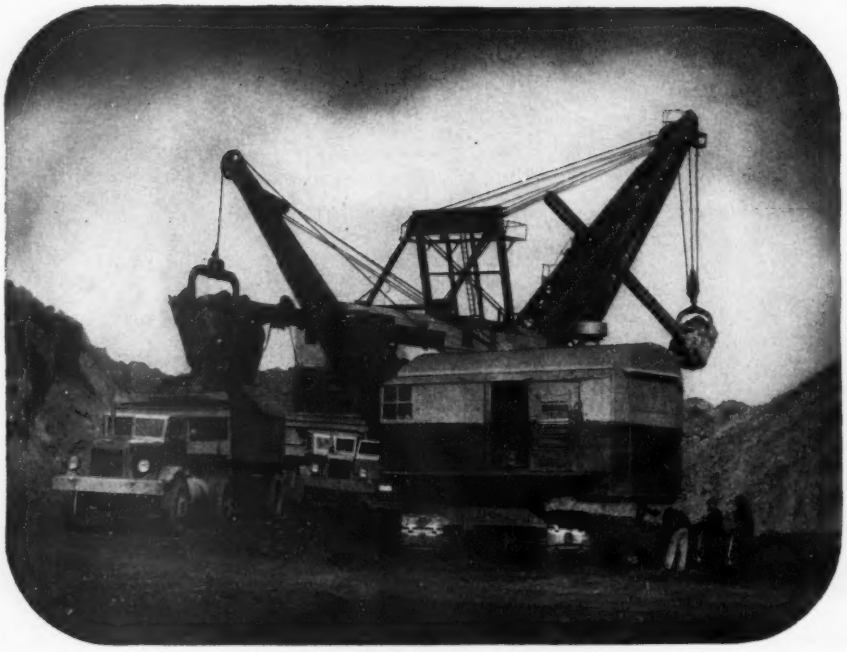
WIRE ROPE



This is the most economical rope we've ever made for mining

ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the miners' best choice for efficiency and long life. This rope has *extra* resistance to crushing and abrasion . . . stands up under rough going. It saves you time and cuts costs.

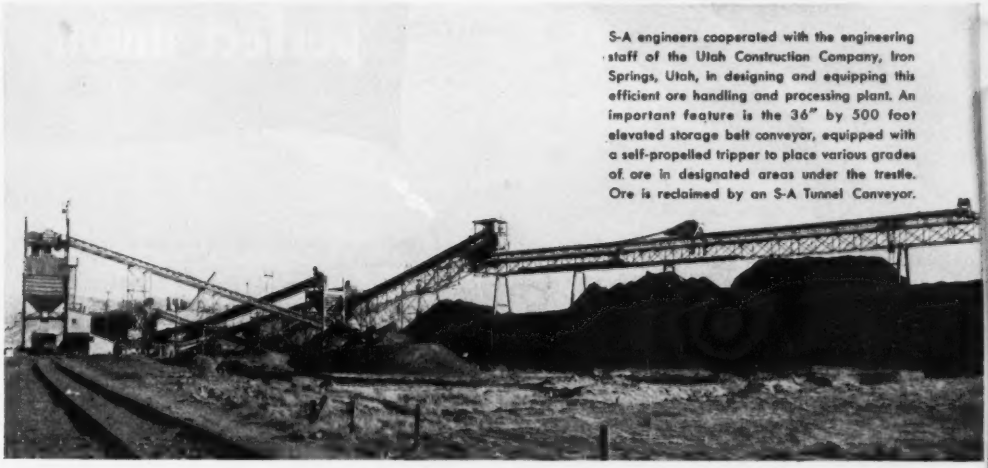
There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, N. J.

S-A CONVEYING *Systems*

for distributing, segregating
and reclaiming ore—
at LOW COST per TON



S-A engineers cooperated with the engineering staff of the Utah Construction Company, Iron Springs, Utah, in designing and equipping this efficient ore handling and processing plant. An important feature is the 36" by 500 foot elevated storage belt conveyor, equipped with a self-propelled tripper to place various grades of ore in designated areas under the trestle. Ore is reclaimed by an S-A Tunnel Conveyor.

Belt Conveyors
Belt Trippers
Belt, Pan & Plate Feeders
"AMSCO" Steel Pan Feeders
Ship Loading Boom Conveyors
Stacking Conveyors
Storage & Reclaiming Systems
Flight & Chain Conveyors
Screw Conveyors
"Natural Frequency" Vibrating Conveyors
REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Conveyor Belt Cleaners
Headshaft Holdbacks
Grizzlies & Screens
Centrifugal Pilers
Bin Gates & Tunnel Gates
Car Pullers & Spotters
Hoists & Winches
Bucket Elevators
Skip Hoists
SealMaster Ball Bearing Units

● Write for a bulletin on any of the above.

● Whether you need a highly specialized conveying-distribution system or simply more efficient ore handling at lower cost per ton—an S-A engineer can help you find the right method and the right equipment *to do your job best.*

In planning with you, he draws upon more than half a century of S-A experience. During that time, thousands of bulk handling problems have been solved—thousands of S-A installations engineered to meet widely varying requirements—some of them undoubtedly similar to yours.

S-A is equipped to meet ever-new demands—the most complete line of equipment assures you an unbiased recommendation. Write us for full details.

STEPHEN S-A ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

Liddicoat ~~Steel~~ meets steel

Result: perfect union

The Liddicoat bit is made with a round socket in which four flats are forged. The socket of the skirt has a slight taper but is malleable and conforms to the straight side of the rod. The bit fastens onto the rod with a drive fit as in contrast with the screw-on type of connection. Any turning of the rod within the bit socket tends to lock tightly the bit to the rod, yet it is easily removed with a weighted knockoff block.

The ease of attachment and detachment is only one of many reasons for the phenominal success Liddicoat has made in drilling operations in all type of ground.

FAST DRILLING — USED TO DESTRUCTION — NO RE-SHARPENING

Liddicoat provides fast cutting performance and long cutting life with a low initial cost per bit and lowest cost per foot of hole drilled. Since re-sharpening is not involved, it has been possible to design the bit for maximum drilling efficiency.

Liddicoat actually chips out the rock instead of battering it until it is pulverized, as is the case with conventional bits. This is the accomplishment of the two stage cutting action and the special wing design which retains sharp cutting portions for the life of the bit.

Test — and then you too will join the ever expanding list of satisfied Liddicoat customers representing many of the world's largest mining and contracting concerns.

PILOT CONSTRUCTION
Section "AA", along the high-centre wings.
Section "BB", along the low-centre wings.

WESTERN
Rock Bit Manufacturing Company
552 West 7th South • Salt Lake City 4, Utah

ROCK RATED!

FOR ROCK BOTTOM COSTS

P&H MAGNETORQUE*

puts an end to the old swing frictions

We'll make this promise: You'll never have to "baby" this machine, even in the heaviest going! It's *built* for it — all-welded of alloy steels throughout, the toughest construction known. *It means steady digging.*

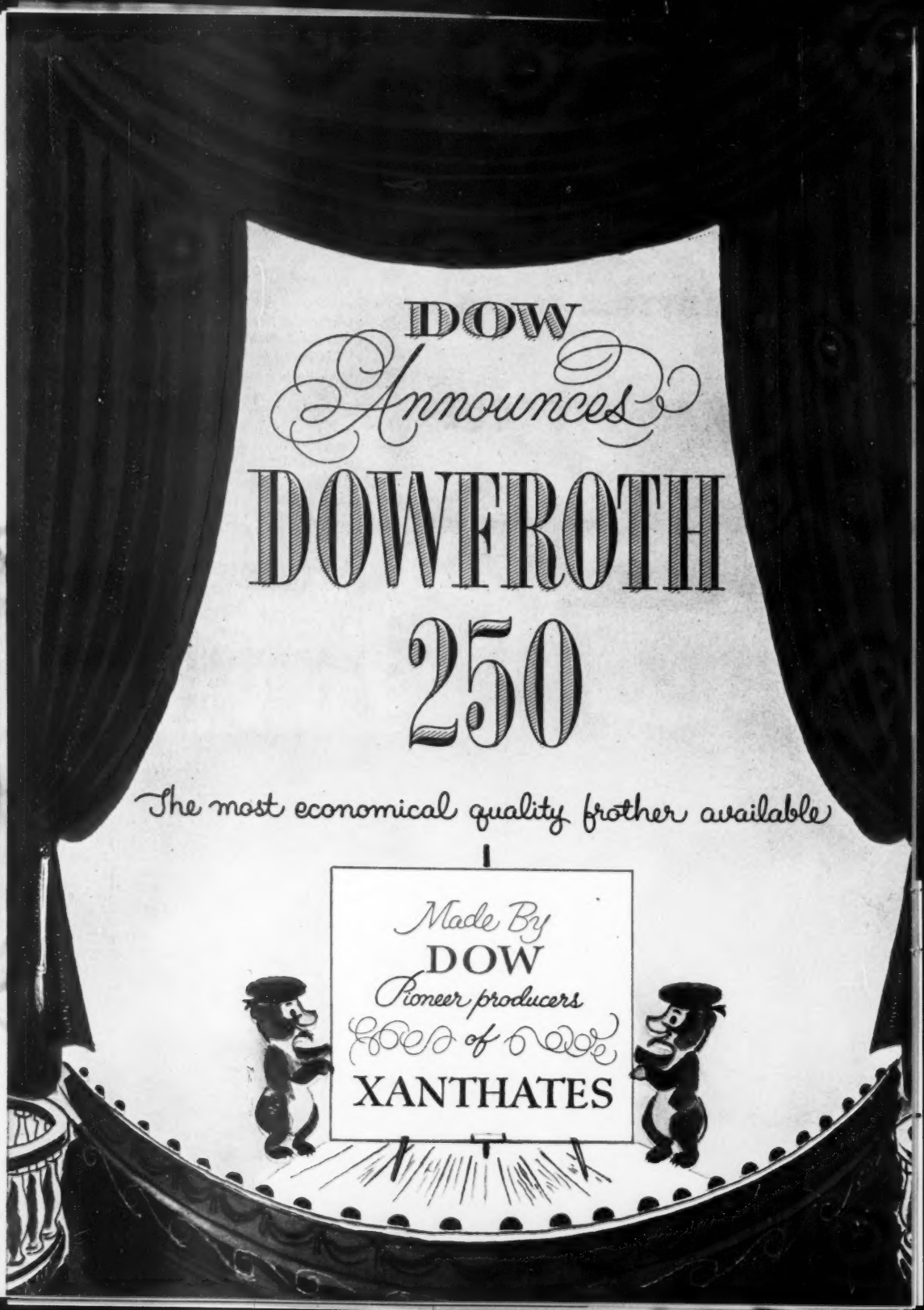
But the big pay-off in extra production comes with Magnetorque electric swing — enough faster to deliver 5 cycles to 4 on other machines in the 2½ yd. class. And the "time-outs" for adjustment and replacement of swing friction linings can now be salvaged for increased yardage. Magnetorque lasts the life of the machine.

*T.M. of Harnischfeger Corporation for electro-magnetic type clutch.

HARNISCHFEGER
CORPORATION
4454 W. National Avenue • Milwaukee 14, Wis.

Ask today for facts about the 955-A. Also the Model 1055 — its companion machine with 3½ yd. capacity.

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES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Announces
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250
The most economical quality frother available
Made By
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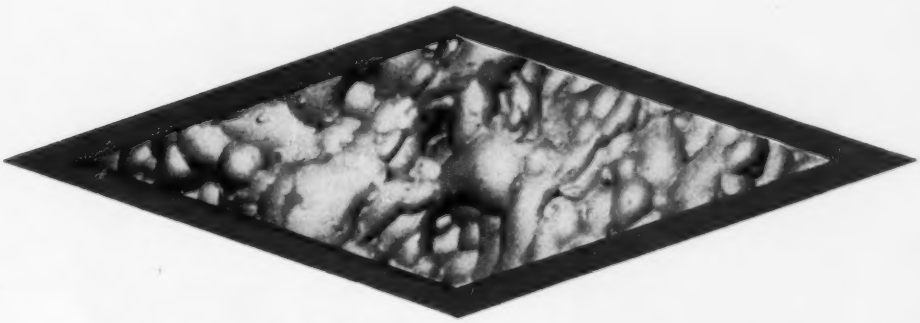
DOWFROTH 250

BETTER FROTHING CHARACTERISTICS

BETTER METALLURGY • WATER SOLUBLE



DOWFROTH 250 has demonstrated better frothing characteristics in actual mill tests where concentrations *as low as one-fourth of normal concentrations* have proved satisfactory. Also, it produces a livelier froth on the machine which is quicker breaking in the launders and pump boxes.

This frother offers a good possibility of improved metallurgy by raising concentrate grade and mineral recovery. DOWFROTH 250 demonstrates little or no collecting power, permitting independent regulation of frother and collector. Moreover, its water solubility permits the addition of DOWFROTH 250 as a water solution and assures return for reuse in mill water recovery systems.

DOWFROTH 250 requires practically no conditioning time and lends itself readily to stage addition. Adequate production facilities assure ready availability in both drum and tank car quantities.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

send for free Mill-Test Sample!

THE DOW CHEMICAL COMPANY, Dept. OC 45A, Midland, Michigan

Name_____ Title_____

Company_____

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City_____ State_____

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

For Extra Trips–Extra Tonnage

Maintains better control of "empties" for peak loading efficiency.

Minimizes chances of error and accidents.

Coordinates trip traffic for safer, more productive haulage control.

Reduces frequency of motormen and snappers getting on and off trips—saves time—avoids injury.

Prevents excessive stop-and-start strain on haulage equipment.

Eliminates trip delays necessary when permanent telephone installations are used.

Avoids excessive power loads for more economical operation.

Provides an efficient, time-saving underground "call" system.

Keeps main line haulage-ways free of traffic tie-ups.

MSA

SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

-Extra Safety

... keep your haulage

AHEAD of PRODUCTION

with the

M·S·A

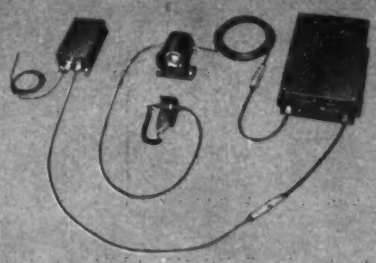
MinePhone

COMMUNICATION SYSTEM

With mechanization increasing production, your haulage system must "keep ahead" to realize maximum tonnage. The M.S.A. MinePhone helps fill this need by providing a modern underground system that maintains smooth, continuous trip movements throughout the mine.

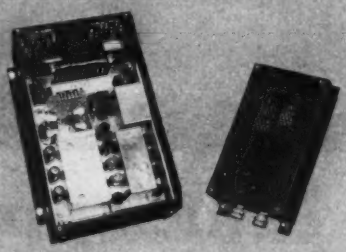
Sending dispatcher's orders instantly and simultaneously to all motormen, who can reply or communicate with each other while trips are in motion, the M.S.A. MinePhone coordinates haulage movements with production demands. Messages, transmitted on an "open line" hook-up, keep the track ahead clear for outgoing loaded trips and incoming "empties."

The M.S.A. MinePhone brings greater underground safety, too. Track conditions, derailments, or roof falls can be reported immediately. Time-consuming calls to each individual are eliminated—a big advantage in emergencies. Write today for complete details on this modern, two-way voice communication system.



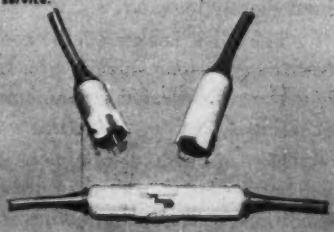
Components of a single station. Resistor box, speaker, microphone, equipment box containing transmitter and receiver units.

Speaker delivers clear voice reproduction. Microphone has press-to-talk button, plus major safety feature of only extremely low voltage present when talking.



Equipment box with cover removed, showing easy accessibility to transmitter and receiver. Separate units simplify service.

Resistor box has protected, heavy-duty industrial type resistors. Can be used on positive or negative trolley installations.



Rubber cable connectors, with water-tight pressure rings molded to the cables. The connectors are covered with heavy steel armor, and are supplied with twist locks to safeguard against mechanical damage and accidental separation.

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STS., PITTSBURGH 8, PA.

At Your Service: 66 Branch Offices in the United States

MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED

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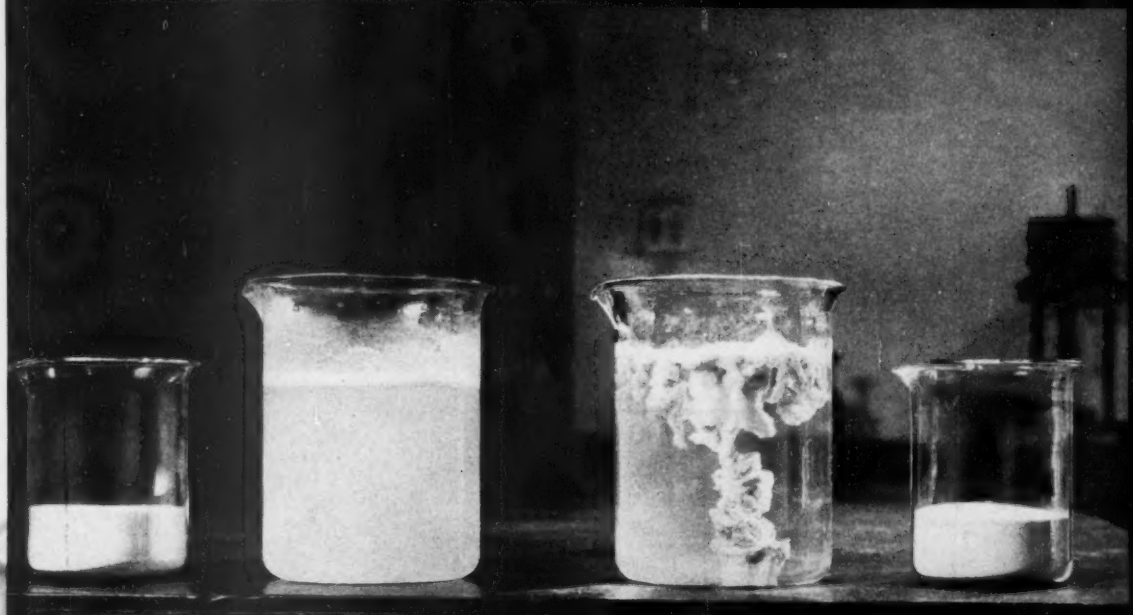
PROGRESS IN EXPLOSIVES . . .



WHICH BEAKER HAD THE BANG?

The small beaker (left) contains ammonium nitrate. This is an important explosives ingredient, but it absorbs moisture readily. Notice in the large beaker (left)—how it dissolves immediately in water.

The small beaker (right) contains *Hercules* ammonium nitrate *treated with a special resin*. In the large beaker (right) note how the resin-treated ammonium nitrate repels water without affecting explosives' properties.

Here is a simple example of Hercules' pioneering that gives you better blasting efficiency under adverse storage and climatic conditions both in manufacture and in field use.

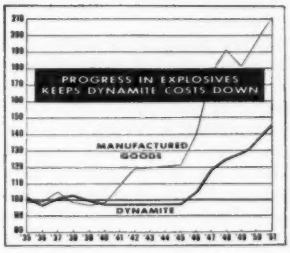


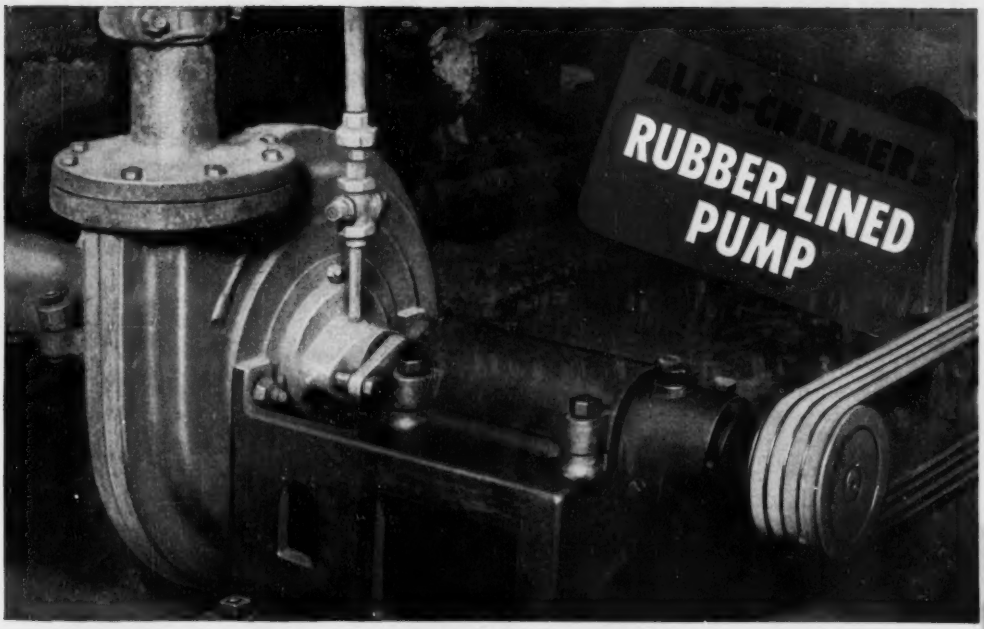
Chart shows relative stability of dynamite prices since 1935, as compared with prices of other manufactured goods. 1935-39 values=100.

HERCULES POWDER COMPANY

INCORPORATED

Explosives Department, 933 King St., Wilmington 99, Del.

XR52-4



UP TO 50 Times Longer Life

HANDLING FINE MESH MATERIALS

PERFORMANCE RECORDS FROM FIFTEEN YEARS of handling all types of slimes, slurries and other fine mesh abrasive suspensions show definite savings from the use of Allis-Chalmers type SRL Rubber-Lined Pumps. Instances of 10 to 50 times the life of the finest alloy pumps built for this service are not uncommon. Not only are pumping costs reduced, but production lost from shutdowns is almost eliminated and standbys often can be done away with.

Unique Lining Method

The rubber lining of the Allis-Chalmers SRL Pump is bonded to a heavy steel skeleton which is simply fitted into the casing. The lining and the casing are not bonded together. When the lining finally must be renewed, the pump need not be dismantled and removed from its location. Replacement cost is kept to a minimum.

Each Installation Specially Engineered

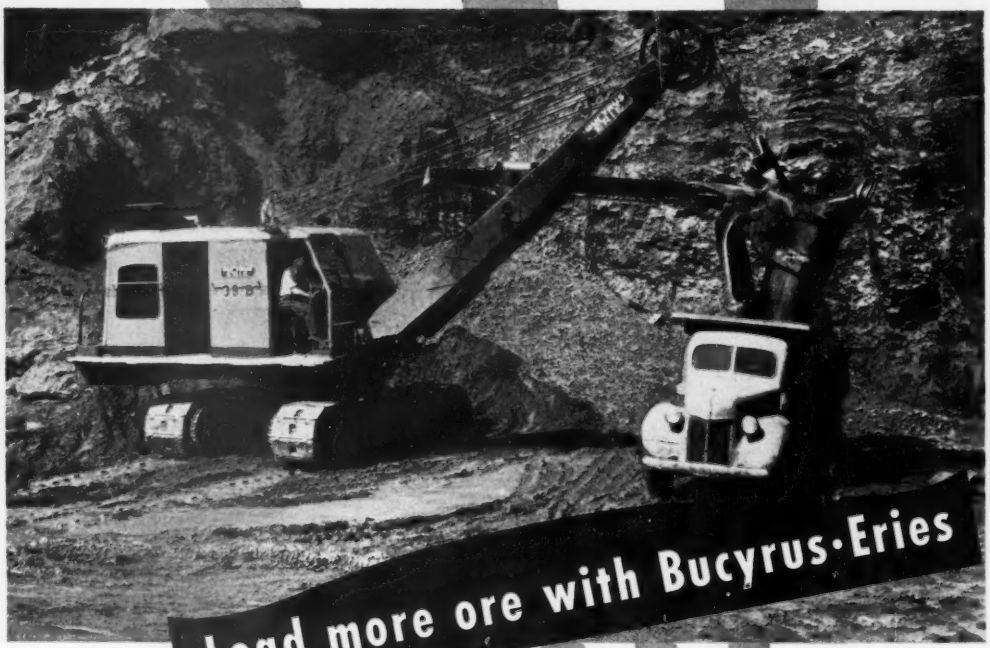
Every pump is individually engineered to provide the best possible performance for the application involved. Special rubber linings of various compounds are available to handle a variety of slurries at low per-gallon pumping cost.

If you are handling sand, taconite, grinding mill discharge, tailings or any other abrasive slime or slurry, ask your Allis-Chalmers representative to show you how you can get long pump life and low cost per gallon pumped. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, and ask for Bulletin 08B7311. A-3698

ALLIS-CHALMERS

Digging • Swinging • Dumping

speed *speed* *speed*



Load more ore with Bucyrus-Eries

For more than five decades the fastest, most efficient ore-loaders in the mining world have been Bucyrus-Eries—acknowledged leaders in their field. That's because their high output features help get the ore out in a hurry—features like smoothly balanced machine speeds and power, coordinated by direct-connected mechanical controls; anti-friction bearings liberally used to assure smooth, steady power flow; and easy-filling dippers to scoop up full loads of ore on each pass, dumping quick and clean with wet or dry material. True simplicity of design and large, strong parts easily accessible for maintenance keep your output high, downtime low —especially important when operating far from repair facilities.

See how a Bucyrus-Erie can help boost **your** output records—contact your Bucyrus-Erie distributor for the full facts.

303E51

BUCYRUS ERIE

South Milwaukee, Wisconsin

Most ***Most***

COMPARED • PREFERRED

3/8 to 4-yd. diesel, gasoline and single motor electric excavators.

World's largest deep frame jaw crusher is protected by Farval lubrication

FARVAL—*Studies in Centralized Lubrication* No. 133

IN the next few months, this mammoth machine will crush three million tons of diorite. Largest deep frame jaw crusher ever built, it is operating on the Detroit dam project in western Oregon.

A highly publicized feature of this project is the cooling of all the aggregates used in the concrete construction. The builder of this crusher insured that the bearings in his equipment would always run cool, too. He equipped it with a Farval Centralized Lubrication System.

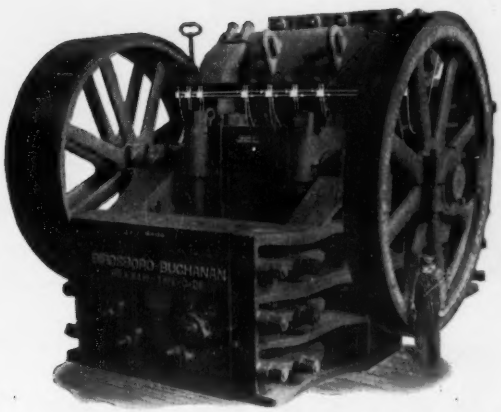
With Farval on the job, no special oilers are needed, lubricant consumption is reduced, bearing life is extended indefinitely and shutdowns for oiling or bearing replacement are eliminated. In short, Farval insures that the crusher can work day in, day out, without interruption from overheated bearings, in doing its part to see that the great Detroit dam is finished according to schedule.

Farval is the original Dualine system of centralized lubrication for industrial equipment, proved practical in 25 years of service. The Farval valve has only two moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. Through its full hydraulic operation, the Farval system unfailingly delivers oil or grease to each bearing—as much as you want, exactly measured—as often as desired. Indicators at all bearings show that each valve has functioned.

In or near your city there's a Farval engineer, ready to discuss your lubrication problems and suggest a proper system to meet your particular needs.

The Farval Corporation, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



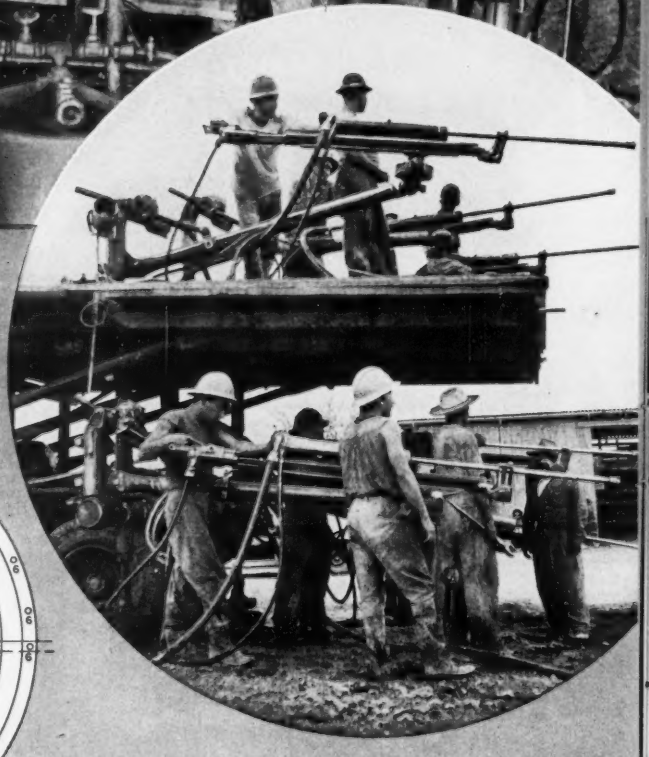
KEYS TO ADEQUATE LUBRICATION—*Wherever you see the sign of Farval—the familiar valve manifolds and dual lubricant lines—you know equipment is properly lubricated. Thus you can see there will be no bearing trouble on this Birdsboro-Buchanan crusher.*

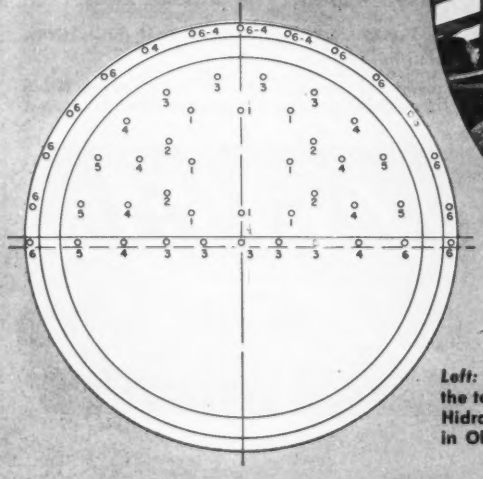
This giant weighs 275 tons, stands 18 feet high, has a 66- x 84-inch jaw opening. It handles feed from a 5-cu.-yd. shovel, discharging a 14-inch product at the rate of 800 t.p.h. It is one of more than fifty thousand industrial machines whose bearings are protected by Farval.

Photo above by courtesy Birdsboro Steel Foundry & Machine Co.

Tunneling

Right: Six-drill jumbo with Le Roi-CLEVELAND power feed drifters and air-motor booms on a 1½-ton truck. 1¼" round-lug steel and 2" carbide bits. Air supply — two 500 cfm compressors.





Left: Standard drill pattern for 50-hole round. Typical of the top-heading and bench method used by Construcciones Hidraulicas, S.A. in driving three 27'-bore circular tunnels in Obregon, Sonora, Mexico.

costs reduced!

with Le Roi-CLEVELAND Drifters and Jumbo Booms

You spot your holes easier — get less overbreak!

You get higher drilling speeds, for faster cycles!

Better fragmentation! More footage per shift! That's the pay-off, when you use Le Roi-CLEVELAND Jumbo Booms and power-feed Drifters in your rock headings. The pay-off that means lower costs on any rock-drilling or tunneling job.

- Le Roi-CLEVELAND Jumbos are versatile. Air-motor powered booms let you spot and space your holes quickly and easily for the most efficient fragmentation. Their greater flexibility lets you keep the tunnel bore close to pay line — with little overbreak or underbreak.

- Rigid, non-slip set-up feature of Le Roi-CLEVELAND Jumbo Booms keeps drifters in line, prevents steel binding, saves wear and tear on chucks.

- Strong rotation of Le Roi-CLEVELAND Drifters — plus snappy, powerful force of blow — give you unexcelled drilling speed. Graduated feed throttle lets you adjust pressure to get maximum footage in any type of rock formation. Fast feed travel makes steel-changing quick and easy.

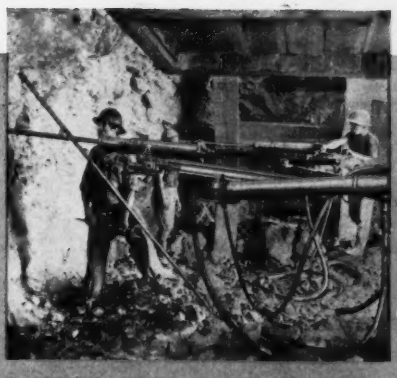
Get more drilling done every shift. Save the money overbreak steals from you. Put the versatility of Le Roi-CLEVELAND Jumbo Booms and the dependable drilling speed of Le Roi-CLEVELAND Drifters to work for you. Write today for complete information.

LE ROI COMPANY

CLEVELAND ROCK DRILL DIVISION

12500 Berea Road, Cleveland 11, Ohio

Plants: Milwaukee, Cleveland and Greenwich, Ohio



The seamy rock in one tunnel at Obregon required 9 sections of timber every 3'. To save time on timbering, the contractors used the Le Roi-CLEVELAND air-motor powered jumbo booms to raise the sections of timber from the top deck of the jumbo to the roof.

Tunnel No. 1 at Obregon is 2411' long; tunnel No. 2, 1378'; tunnel No. 3, 1850'. Tunnel bores were so regular one observer said they must have been cut with a knife.

Will Your Pressure Regulators Last 25 Years?

...on Molding Press Service

for instance

THE INSTALLATION

Crane Brass Pressure Regulators on steam lines to rubber molding presses; Dryden Rubber Division, Sheller Mfg. Corp., Chicago. 225 units in service.

VALVE SERVICE RATINGS

FEATURES:	Equally good on steam or air
SUITABILITY:	Steady outlet pressure - no drift
MAINTENANCE COST:	Routine servicing only
SERVICE LIFE:	Many installed more than 25 years — Still O.K.
OPERATING RESULTS:	Fully automatic steam control at lowest cost
PRICE:	Good Buy - has no equal
AVAILABILITY:	Stock item in Crane Line

THE HISTORY

Steam generated at 130 psi is reduced through individual regulators on molding presses. Pressure used at machines is 60 to 100 psi depending on work. Features of regulator service needed most are: (1) nonfluctuating outlet pressure automatically maintained within close regulation; (2) easy adjustment by press operator to specified pressure for given work.

More than 25 years ago the plant standardized on Crane Regulators, a total of 225 being in use today. Many are the original installations, still delivering desired outlet pressure. Records for all regulators, regardless of age, show no maintenance cost other than prescribed simple routine servicing. On old models of the Crane 960 regulator, after prolonged service, this includes occasional regrinding of seats.

THE VALVE

Crane No. 960 Brass Pressure Regulators reduce steam or air pressures up to 250 psi, to within 80% of inlet pressure. Factory pre-set to operate within any of 4 ranges from 1 to 200 psi, with easily selected service pressure within set range. Precision made; fully automatic; highly dependable, even under reasonable fluctuation of inlet pressure. All wearing parts renewable. See your Crane Catalog or Crane Representative for full data.

The Complete Crane Line Meets All Valve Needs. That's Why—

More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

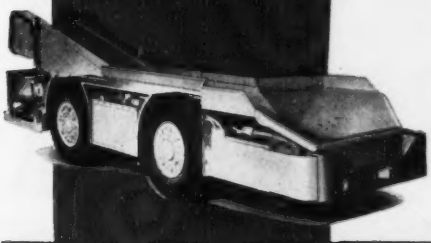
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Modern Metal Mine Haulage Calls for Modern Methods like this

JEFFREY SHUTTLE CAR

Above—a Jeffrey 42-inch high Cable Reel Shuttle Car operating in a prominent lead mine, hauling ore from working place to main haulage system. An outlined view of this Car is shown left—below.



Jeffrey Shuttle Cars, operating in the coal fields, have come closer to continuous production than any other system developed to date. Rock-handling Shuttle Cars are applicable to many metal and non-metal operations—will provide efficient and dependable service in the handling of ores.

This method of haulage has advantages of flexibility, mobility, quick loading and discharging—which make for large tonnages and low-cost operation. They are available in cable reel types.

Call in a Jeffrey Mining Engineer—let him help you determine the equipment best suited to your operation.

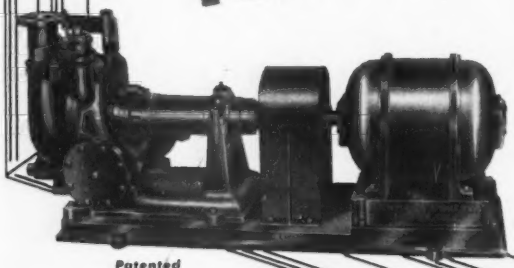
THE JEFFREY MANUFACTURING COMPANY

Established 1877

1877 75 1952

WILFLEY
centrifugal PUMPS

Handling rod mill discharge

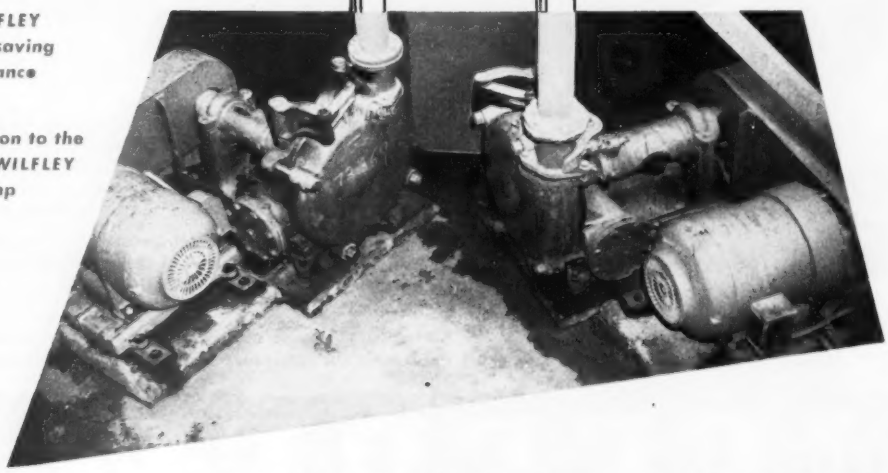


Patented

The Model "K" WILFLEY is THE pump to buy when the job calls for a rugged, heavy-duty pump that delivers higher efficiencies, stepped-up production, worthwhile power savings and lower operating costs. Continuous, 24-hour-a-day performance. Easy interchangeability of wear parts. Low maintenance costs. Every application individually engineered. Write or wire for details

Buy WILFLEY for cost saving performance

Companion to the famous WILFLEY Acid Pump

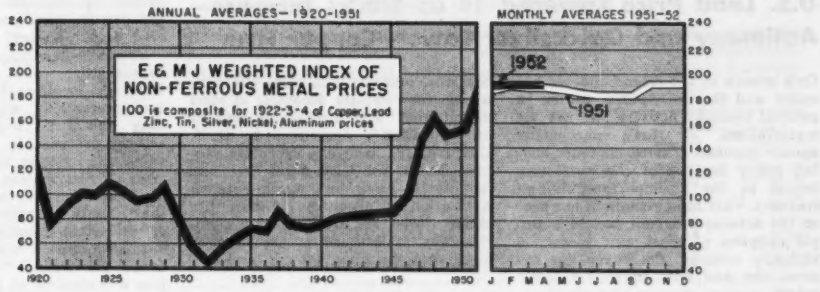


5" Model "K" Wilfley Sand Pumps in a large western sand and gravel plant handling 30% solid discharge containing highly abrasive 3/16" silica from rod mill.

A. R. WILFLEY & SONS, INC., DENVER, COLORADO, U.S.A.
NEW YORK OFFICE: 1775 BROADWAY, NEW YORK CITY

E&MJ OUTLOOK

PRICES



MARKETS

Lead dropped 1¢ per lb. late in the month, and seemed headed lower under pressure of offerings of lead from abroad at below the domestic market. As a result, the *E&MJ* index of nonferrous metal prices declined from 195.10 in March to 194.93 for April.

Metal markets were badly shaken by the fall in lead. Buyers were not coming in at the lower price; foreign lead was offered below the new domestic price. **Zinc's position is uncertain,** with the steel strike halting flow of metal to galvanizers, and consumers uneasy as to price.

Copper is still tight, however, owing largely to the strike at Chuquicamata. Stockpile copper may have to be released before long, although a long strike at Chuqui is believed unlikely.

•

LABOR

Mine, Mill is betting that fear of seizure will make mining companies bow to their demands for a 25¢ increase this year. A lot depends on what the Supreme Court does with the steel case, but seizure or not, softening metal markets make it a poor time to demand a big wage boost.

•

AT HOME

The economy's drifting at the moment, with neither strong upward nor downward trends evident. Most economists, agreeing that consumer apathy is likely to continue, look to increased military spending to support industrial activity through the year.

Actual consumption of metals isn't likely to decline very much, but demand is certainly easing as consumers' fears about shortages are relieved. Note that the high price finally pushed lead receipts at U. S. smelters up to 55,000 tons for March from about a 40,000-ton level last year.

Don't look for early support from stockpiling of lead. After buying over 100,000 tons from abroad, the stockpilers seem to be out of the market, pending assignment of more funds or laying down new policy.

The tariffs on lead and zinc won't go back on until their prices have averaged below 18¢ per lb. for a calendar month. Meanwhile, foreign offerings of both are undercutting the U. S. market.

Cheerful note: There's a good chance that new major mining districts may be developed in the United States as a result of certain current exploration activities.

•

ABROAD

Look for trouble in Bolivian tin mining despite Estenssoro's smiles and amicable gestures toward "foreign capital." Juan Lechin, minister of mining, isn't smiling; he's out for capitalist blood.

Canada's discovering new zinc orebodies at a rate that will allow it to produce 500,000 tons of zinc annually in a few years.

MARKETS—Trends and Prices

U.S. Lead Price Lowered 1¢ as Stocks Increase—Antimony and Quicksilver Lower—Copper Firm

ONE MONTH of the second quarter has ended and the anticipated upturn in general business activity has not yet materialized. In fact, purchasing agents pursued a more cautious buying policy because of the conflicting trends in the all-important civilian economy. Vast sums remain to be spent on the defense program, but with ample supplies of most raw materials virtually assured, the buyer has become shy and now hopes for lower prices.

The dispute in the steel industry has been a contributing factor in unsettling business. President Truman's seizure of the steel mills was invalidated by Judge David Pine of the U. S. District Court at Washington on April 29. An immediate shutdown of the steel plants was ordered by Philip Murray, head of the United Steelworkers. The U. S. Court of Appeals, by a 5 to 4 vote, restored government control of the mills on the following day to permit an appeal to the Supreme Court. Production was resumed pending further developments.

Prices Unsettled

Excepting copper, nickel and a few minor metals the price situation has undergone a marked change. Metals that were scarce six months ago have become plentiful. Lead was the outstanding example of completing a cycle from that of a seller's market to one favoring the buyer. The stockpile failed to take on additional tonnages and smelters felt that they could not support a price that was obviously too high under prevailing uncertain conditions. The price was reduced 1¢ per lb. on April 29, the first downward revision in the metal in almost two years. Antimony was reduced 6¢ per lb. by the leading producer on April 25. Quicksilver also sold at lower prices.

The decline in lead caused the *E&MJ* index of nonferrous metal prices to go off from 195.10 in March to 194.93 in April. A year ago the index stood at 190.18.

The Federal Reserve Board's index of industrial production declined from 222% of the 1935-39 average in February to 220% in March, with estimates for April pointing to another moderate loss. The authorities in Washington are doing what they can to ease up on various regulations restricting consumption.

Decontrol of lead, antimony, cadmium and bismuth is likely by the middle of May. Zinc allocations may be dropped later in the month. Even the steel industry has come out with a plan for complete decontrol of steel distribution "with a minimum amount of dislocation." According to B. S. Chapple, Jr., assistant executive vice president of the U. S. Steel Co., steel inventories have once again reached a position of adequacy. Before the strike closed the steel mills, production was maintained at the rate of more than 2-million tons a week.

Chile's Copper Problem

Some sort of a solution of Chile's pressing problem of obtaining increased revenue from its copper industry is expected shortly. So far, the "unofficial" proposals centered around a higher price, which could touch off another general increase at a time when prices for many basic commodities are weakening. Should U.S. officials back Chile's demands, it is almost certain to open up price discussions on the home front.

Workers at Anaconda's mines in Chile postponed the date for walking off their jobs from April 6 to April 25. A request to arbitrate was turned down by the miners, but after a shutdown of several days they agreed to discuss their case with high officials and there was hope of an early settlement and a resumption of production at Chuquicamata and Potrerillos. A long shutdown would bring on another squeeze in copper in June or July. In industry circles it was felt that stockpile metal would again be released in the event that defense work is threatened. The U. S.-Chilean agreement will end on May 8.

Premium prices for copper in the European market declined steadily until the news from Chile took a turn for the worse. There were offerings of "free" copper at 35¢ per lb., July-August delivery, with the market relatively quiet. As the month ended the asking prices firmed up again, with quotations ranging from 37¢ to 40¢, depending on time of shipment. The producers' market continued at 24½¢ in the U.S. and at 27½¢ on foreign copper.

Lead Price Reduced 1¢

Offerings of lead were in excess of the demand. The drop in the price was not unexpected. With foreign buyers virtually out of the market, and in the absence of support by way of additional purchases for the stockpile, prices weakened all around. Scattered lots were available from European sources at 17¼¢ and even less, c.i.f. New York. As the price named on domestic lead dropped to 18¢ per lb., Mexican metal was lowered to 17½¢, Gulf ports.

Zinc also is easing and a reduction in the price would surprise no one. However, smelters in most instances are comfortably situated so far as May and June are concerned and selling pressure is expected to develop more slowly than in lead. Controls on distribution will come off in the near future on conclusive evidence that supply is sufficient to take care of estimated requirements. The domestic quotation was maintained at 19½¢ for Prime Western. Foreign zinc was nominal at 19½¢, Gulf ports.

Antimony broke sharply on lower ore quotations and increased offerings of the metal from abroad. The price declined to 44¢ per lb., 99½% grade, in bulk, carload lots, f.o.b. Laredo, Tex. Foreign metal was available at 40¢.

Quicksilver sales were in fair vol-

Average Prices for April (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	24.200
Electrolytic, export, refinery	27.425
Lead:	
Common, New York	18.923
Common, St. Louis	18.723
Silver and Sterling Exchange:	
Silver, New York, per oz.	88.000
Silver, London, pence per oz.	77.000
Sterling Exchange, "Checks"	280.722
Zinc:	
Prime Western, East St. Louis	19.500
Tin:	
New York Straits	121.500
New York, 99% min. (e)	120.500
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$203.769
Antimony (E&MJ) (d)	52.196
Antimony, bulk, Laredo	48.846
Antimony, in cases, Laredo	49.346
Platinum, refined, per oz.	$90.000
Cadmium, (a)	255.000
Cadmium (b)	267.500
Cadmium (c)	280.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.
(a) Cadmium average based on the producers' quotation.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.

ume early in the month, but moderated later on price unsettlement.

OPS established a ceiling price of $93 an oz. troy on platinum, effective April 26. However, the regulation stipulates that until July 27, 1952, sellers may make shipments at prices up to $105 to encourage the sale of hoarded stocks. Important sellers continued to quote $90 on wholesale lots and $93 on sales to consumers.

Tungsten ore in the foreign market was nominal at $57 per unit, f.o.b. port of shipment. Manganese ore was irregular with ocean freight rates lower.

"Free" Gold Market

The trend toward more stable currency conditions in European countries has been reflected in an easier market for gold. Volume was off and prices weak.

Quotations for "free gold," per fine oz., according to Pick's World Currency Report:

	COINS		BARS (12.5 kg.)	
	Mar. 31	April 30	Mar. 31	April 30
NEW YORK, transit	.....	.....	$38.25	$37.38
MANILA	$49.25	$48.50	40.00	39.75
HONG KONG	48.75	47.50	41.25	40.00
BOMBAY	53.50	51.00	47.50	46.75
TANGIER	50.50	49.85	38.25	37.65
BEYROUTH	50.50	48.95	38.38	37.60
PARIS	54.00	53.50	40.75	39.25
BUENOS AIRES	52.00	49.50	41.75	41.13

(*Markets continued on page 101*)

Major Metals

U. S. DAILY AND AVERAGE PRICES

April 1952	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
1	24.200	27.425	121.500	19.000	18.800	19.500
2	24.200	27.425	121.500	19.000	18.800	19.500
3	24.200	27.425	121.500	19.000	18.800	19.500
4	24.200	27.425	121.500	19.000	18.800	19.500
5	No Market	27.425	121.500	19.000	18.800	19.500
7	24.200	27.425	121.500	19.000	18.800	19.500
8	24.200	27.425	121.500	19.000	18.800	19.500
9	24.200	27.425	121.500	19.000	18.800	19.500
10	24.200	27.425	121.500	19.000	18.800	19.500
11	24.200	27.425	121.500	19.000	18.800	19.500
12	No Market	27.425	121.500	19.000	18.800	19.500
14	24.200	27.425	121.500	19.000	18.800	19.500
15	24.200	27.425	121.500	19.000	18.800	19.500
16	24.200	27.425	121.500	19.000	18.800	19.500
17	24.200	27.425	121.500	19.000	18.800	19.500
18	24.200	27.425	121.500	19.000	18.800	19.500
19	No Market	27.425	121.500	19.000	18.800	19.500
21	24.200	27.425	121.500	19.000	18.800	19.500
22	24.200	27.425	121.500	19.000	18.800	19.500
23	24.200	27.425	121.500	19.000	18.800	19.500
24	24.200	27.425	121.500	19.000	18.800	19.500
25	24.200	27.425	121.500	19.000	18.800	19.500
26	No Market	27.425	121.500	19.000	18.800	19.500
28	24.200	27.425	121.500	19.000	18.800	19.500
29	24.200	27.425	121.500	18.000	17.800	19.500
30	24.200	27.425	121.500	18.000	17.800	19.500
AVERAGES FOR MONTH						
April	24.200	27.425	121.500	18.923	18.723	19.500
AVERAGES FOR WEEK						
April						
2	24.200	27.425	121.500	19.000	18.800	19.500
9	24.200	27.425	121.500	19.000	18.800	19.500
16	24.200	27.425	121.500	19.000	18.800	19.500
23	24.200	27.425	121.500	19.000	18.800	19.500
30	24.200	27.425	121.500	18.667	18.467	19.500
CALENDAR WEEK AVERAGES						
April						
5	24.200	27.425	121.500	19.000	18.800	19.500
12	24.200	27.425	121.500	19.000	18.800	19.500
19	24.200	27.425	121.500	19.000	18.800	19.500
26	24.200	27.425	121.500	19.000	18.800	19.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

April 1952	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold London	Gold (d) United States
1	281.000	88.000	77.000d.	248s.	$35.00
2	281.000	88.000	77.000d.	248s.	35.00
3	280.750	88.000	77.000d.	248s.	35.00
4	279.875	88.000	77.000d.	248s.	35.00
5	(e)	(e)	(e)	(e)	35.00
7	280.625	88.000	77.000d.	248s.	35.00
8	280.500	88.000	77.000d.	248s.	35.00
9	280.750	88.000	77.000d.	248s.	35.00
10	280.625	88.000	77.000d.	248s.	35.00
11	280.625	88.000	77.000d.	248s.	35.00
12	(e)	(e)	(e)	(e)	35.00
14	280.625	88.000	77.000d.	248s.	35.00
15	280.625	88.000	77.000d.	248s.	35.00
16	280.750	88.000	77.000d.	248s.	35.00
17	280.750	88.000	77.000d.	248s.	35.00
18	280.750	88.000	77.000d.	248s.	35.00
19	(e)	(e)	(e)	(e)	35.00
21	280.750	88.000	77.000d.	248s.	35.00
22	280.750	88.000	77.000d.	248s.	35.00
23	280.750	88.000	77.000d.	248s.	35.00
24	280.875	88.000	77.000d.	248s.	35.00
25	280.875	88.000	77.000d.	248s.	35.00
26	(e)	(e)	(e)	(e)	35.00
28	280.875	88.000	77.000d.	248s.	35.00
29	280.875	88.000	77.000d.	248s.	35.00
30	280.875	88.000	77.000d.	248s.	35.00
AVERAGES FOR MONTH					
April	280.722	88.000	77.000d.	—	35.00
AVERAGES FOR WEEK					
April					
2	281.000	88.000	—	—	—
9	280.500	88.000	—	—	—
16	280.650	88.000	—	—	—
23	280.750	88.000	—	—	—
30	280.875	88.000	—	—	—

Calendar week averages, New York Silver: April 5th, 88.000; 12th, 88.000; 19th, 88.000; 26th, 88.000.
(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

E&MJ HIGHLIGHTS

This May issue emphasizes the "how to" of our industry:

- **Duval Sulphur & Potash Co.** erected a headframe near the shaft and slid the headframe into position when the shaft was ready. How and why, page 78.

- **Free exchange of information.** On page 88, Fernando Benitez describes the Chilean technique of saving sulphuric acid by leaching oxide copper ores with niter cake. Señor Benitez visited the U. S. in April to study our techniques.

- **Geologist Thomas E. Gillingham** has made an end-to-end study of maps—sizes, modules, filing and related problems. On page 89, he shares with us the resulting know-how.

- **At Stibnite, Idaho**—a sportsman's paradise—Bradley Mining Co. now produces about 97% of the antimony mined in the U. S. John Huttl's story on page 72 is about the entire antimony-tungsten-gold operation but tells mainly how the new electric smelter works.

- **Today and tomorrow,** here, there, and everywhere, the big question on gold is price. Herbert Bratter—a gold-silver expert—explains why the free and black-market price of gold is likely to remain high. Page 96.

- **Two features**—they'll be regular from now on—have been added to the second page of "This Month in Mining." They're a calendar of coming events, and a guide to sections of that department. Page 123.

- **If you haven't** the time or chance to read the full annual reports of our mining companies, we recommend that you read the digests of same on page 130.

The great expansion in mining continues:

- **Manganese.** In Arkansas, Westmoreland Manganese Corp. is getting set to produce 52,800 annual tons of concentrate starting early in 1953—page 95. In Maine, USBM is getting ready to drill deposits in Aroostook County; they're estimated to contain several-hundred-million tons of low-grade.

- **Chrome.** The big (80% of U. S. reserves) Mouat chrome deposits in Stillwater County, Mont., will be developed again. Under a DMPA agreement, American Chrome Co. will get loans totaling up to $2,765,000 for production of about 100,000 annual tons of chrome concentrate starting about May, 1953.

- **Taconite.** To Erie Mining Co. went the biggest single certificate of necessity ever issued by DPA. It allows fast write-off of 75% of $298-million Erie will spend for its 5-million-ton taconite plant.

- **Zinc.** Anaconda (page 123) is getting ready to double zinc production from Butte, Mont. by 1957. And by 1951 figures, Montana is already the top zinc-producing state.

Quotes of the month:

- **"Hello, Boss."** *U. S. Steel Corp.'s Ben Fairless to Secretary of Commerce Charles Sawyer.*

- **"What a pity** our grandchildren are not old enough to appreciate the magnificent generosity we are displaying with their money." *D. A. Hulcy, president of Chamber of Commerce of the U. S.*

ENGINEERING AND MINING JOURNAL

MAY, 1952

Seizure—Who's Next?

"HOW DOES IT FEEL TO BE SEIZED?" we've been asking our friends in the steel companies these last few days. The answers, despite the unprintable content of most of them, show that government seizure is a surprisingly unobtrusive process, at least in the beginning.

The plant manager is appointed as Uncle Sam's agent. The flag is run up over the plant. Everybody goes back to work, and that's that. On the surface, there's no change. The hours, the jobs, the problems, the techniques—all the same. But everyone has an uneasy feeling that things are never going to be quite the same again. And they are right.

When President Truman dropped the dignity of his office in a recent radio address and assumed the role of a bargainer for a labor union, he set a new low in the standards of conduct observed by this nation's chief executive. We noted, for example, that he made use of the worn device of citing profits of steel companies as "exorbitant" without mentioning that he referred to profits before taxes. The Mine, Mill & Smelter Workers' left-wing propagandists used to do that but have given it up of late, apparently as too flimsy an attempt to deceive.

But the worst effect of President Truman's incredibly bad handling of the steel crisis, is the precedent for government control that his seizure of the steel companies may set. Unless the action is reversed by the courts, the government could, even in peacetime, deal separately with the CIO Steelworkers, give them the wage benefits and the union shop suggested by the Wage Stabilization Board, then hand back the wreckage to the steel companies to run as best they could.

We dislike using the word socialism, because it is so swiftly and frequently whipped out and plastered on whatever idea it is, different from your own, that the other fellow wants to try. Through excessive use, it has lost its power to frighten people. But there's no escaping the fact that government seizure has been resorted to in labor disputes ever more frequently of late, and on an ever-diminishing basis of legality. Where can that end but in government operation, unless government seizure can be made unpalatable to labor and management alike?

The nonferrous unions feel they have more to gain by seizure; they will simply cling to outrageous demands until the threat of strikes brings the government in as employer. What labor leader, with the example of the CIO Steelworkers before him, would fail to be tempted to try for the WSB's brand of "stabilization," too?

How then can the nonferrous industry avoid the pitfall of eventual government seizure? After all, the Mine, Mill union has already announced a drive for wage increases that would go well beyond any likely settlement in steel. Obviously, the objective should be, as it has been for years, to keep the bargaining out of the government's hands.

There is some hope that this may be done. The reasons are these:

1. Mine, Mill is led by men, many of whom would rather not have their party affiliations subjected to too close government scrutiny.
2. The nonferrous metals industries are far from completely organized by any one union, as are the steel, coal, and railroad industries.
3. There are still many small producers of nonferrous metals, which makes the industry harder to seize.
4. The industry does not present quite so tempting and vulnerable a target for seizure as does steel.

Clearly it devolves upon those companies that will this year renew contract negotiations in the nonferrous industry to bring every resource to bear to keep bargaining where it belongs, in the mine office and not in Washington.

We don't want President Truman, nor any president who comes after him, fixing wages and working conditions for copper miners. The warning of the steel case should be ample.

Trouble In Tin

ASSUMING THAT NO COUNTER-REVOLUTION overthrows the regime of Bolivian revolutionary Victor Paz Estenssoro (by no means an altogether safe assumption), what can one expect of that regime's attitude on Bolivian exports of tin?

First, the revolutionists have loudly condemned the owners of the "Big Three" tin mining companies. Second, Señor Paz Estenssoro has said he thought he could get a better price out of the U. S. for Bolivia's tin than the government he overthrew, and that whatever he got would "go to the people."

These statements, of course, have the familiar ring of all such demagogic pronunciamentos. So often they have been merely the prelude to a deal that profited the liberators and left "the people" as they had been.

But there's one difference: Juan Lechin has been named minister of mines for Bolivia. Had President Truman named John L. Lewis secretary of interior, it would not have created so potentially troublesome a situation. Juan Lechin wants to be South America's John L. He's tough, capable, and determined. The revolution probably couldn't have succeeded without him, but he'll be hard to handle now he's in.

It hardly seems possible that the scrambled jigsaw of Bolivia's economy can be fitted together inside of months of negotiation, despite the world's need of tin and Bolivia's need for money. Juan Lechin, as minister of mines, won't make it any easier. You'll hear of him again.

TUNGSTEN PLACER OPERATION, separate from pit, is up far left valley in photo on right.

MOVING CRUSHER PLANT, center, is releasing remnants of rich World War II tungsten orebody. Antimony comes from left section.

Yellow Pine Is Expanding Its

JOHN B. HUTTL, Associate Editor

WHAT'S NEW AT STIBNITE?

First, there's increased emphasis on tungsten.

• Since Korea, Bradley Mining Co. has set up a new 1,000-yd.-per-day placer plant to work tungsten-bearing glacial till near the mouth of Yellow Pine pit.

• In the Yellow Pine pit, remaining portions of the great World War II tungsten orebody could not be mined because they were under the primary crushing plant. To release this hardrock tungsten, Bradley is now moving the crushing plant to a new site, and expects to complete the move by September, 1952.

• In the mill, there's a new flotation-gravity circuit for the recovery of tungsten from ore now being mined (it contains disseminated tungsten in small amounts) and from old mill tailings. Later, substantial amounts will come from the remainder of the World War II orebody.

Second, and most important, there's the new antimony smelter.

• It completes Bradley's chain of operations—treats antimony and gold concentrates from the mill, and produces nearly 6,000 tons of antimony oxide per year.

From an Aero Service Corp. Relief Map

STIBNITE is in a scenic, primitive area, 76 mi. (six hr.) by road from Cascade, or 45 min. by air from Boise.

The Placer Tungsten Plant

Placer tungsten ore occurs in an old river bed about 20-ft. thick. It is mined by shovel and trucked to a stockpile near the new gravity plant. A dragline removes ore from the stockpile at the rate of 1,000 tons a day, and feeds it onto a 4-in. steel grizzly over a 30-ton storage bin. Oversize goes to waste. Undersize falls into the bin and is fed by a pan feeder to a 30-in. conveyor belt which delivers it to two 3x14-ft. washing trommels.

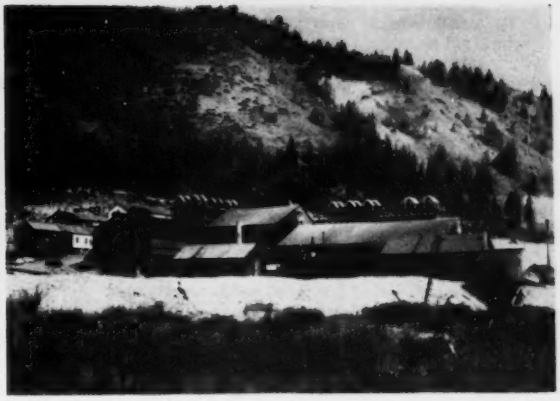
Trommel oversize (minus-4-in., plus-⅜-in.) goes to a picking belt which passes through a darkroom. There, under two 10-in. ultraviolet lights, workmen select a product containing about 30% WO_3, and sack it for sale. Rock remaining on the belt goes to waste.

Undersize from the trommels (minus-⅜-in.) goes to four 42x42-in. Pan-American rougher jigs in series. They make three products—a high-grade bed concentrate, a hutch concentrate, and a tailing.

Rougher-jig bed concentrates, assaying about 60%-plus WO_3, go to the magnetic separator and sacking plant at the concentrator.

Rougher hutch concentrates are retreated in a 12x18-in. Denver duplex cleaner jig operating in closed circuit with the roughers. The product from the first hutch of the cleaner jig, assaying 8-16%

MILL TREATS 2,400 daily tons of antimony-gold ore, now recovers scheelite.



ELECTRIC SMELTER treats antimony and gold concentrates, produces antimony oxide or metal, and rich residue.

Output of Strategic Metals

WO_3, is stored in barrels pending magnetic separation.

Product of the cleaner jig's second hutch goes to a 4x8-ft. concentrating table, which produces a high-grade concentrate of 15-25% WO_3, and a low-grade concentrate of 3-6% WO_3.

Tailing from the rougher jigs passes over a ⅛-in. screen and the undersize then goes to four 2x12-ft. corduroy tables which produce an 11% concentrate. Screen oversize and table tailing go to waste.

The magnetic separator produces several high-grade concentrates for shipment and sale: Rougher jig-bed concentrates are upgraded from 60% WO_3 to 70%. The high-grade table concentrate goes from 15-25% to about 50%. And the product from the first hutch of the cleaner jig, from 8-16% to 45%.

The lower grade products are shipped to a chemical processing plant in California.

A Brief Look at Geology and Mining

The orebodies now being exploited are in a wedge-shaped zone formed by the intersection of the North and South Meadow Creek fault and the Sugar Creek fault.

There are three main mineral values: antimony occurs closely associated with gold in the mineral stibnite; gold is carried in pyrite and arsenopyrite; and the valuable tungsten mineral is scheelite.

From a point of mineral yield, the pit is divided into two parts. On the west side, the main ore mineral is stibnite, which occurs disseminated through the ore and in high-grade stringers. Today, mining operations are centered in this antimony side of the pit.

On the east side, the main value is gold, though the ore also carries stibnite, but in lesser amounts.

In 1943, underground mining produced about 300 tons per day, and open-pit mining produced about 500—for a total output of 800 tons per day.

Now, Yellow Pine ore is produced entirely by open-pitting, and extraction is up to about 2,500 tons per day. Stripping is well in advance of mining, and the ultimate ore-waste ratio is estimated to be 1 to 1½. When fully developed, the pit will be about 1,500 by 2,500 ft.

Depth is more than 450 ft. Bench heights in general are 40 ft., but some are carried at 80 ft. near the pit limits, and others are less than 40 ft. in the narrower sections of the orebody.

The entry is by both the spiral and switchback road systems. Practice is to maintain a grade not exceeding 8%. The main ore haulage road from the pit to the new primary crusher is on a 7% grade, and is about ½-mi. in length for the average haul. But some short stretches are considerably steeper, reaching as high as 12%.

Drilling and Blasting. Most bench drilling is done vertically with Bucyrus-Erie 22-T 6-in. churn drills. The holes are spaced at 10 to 12 ft. intervals; loaded with 5x16-in. DuPont special gelatine and DuPont Red Cross bag powder; stemmed with mill tailings; and detonated with millisecond delay caps.

In extra hard ground, an additional row or two of horizontal holes are wagon-drilled along the toe. They are spaced 6-ft. apart with a 6-ft. interval between rows. Some of the shorter benches are drilled with horizontal holes only.

Loading equipment, all diesel powered, includes:

No.	Make	Model	Dipper
1.....	B-E	54-B	2½-yd.
1.....	B-E	44-B	2-yd.
1.....	Lima	602	1¾-yd.
2.....	B-E	37-B	1¾-yd.
2.....	B-E	20-B	¾-yd.

The larger units are used in the pit, but crane and dragline attachments are available for both of the 37-Bs and 44-B. The two 20-Bs are used primarily for utility work; for these units, Bradley also has crane and backhoe attachments, and dragline buckets.

Hauling ore from the pit to the primary crushing plant are 11 diesel trucks—seven 15-ton, 9.7-yd.

Euclid trucks and four 5-yd. Koehring Dumptors.

The crusher plant near the mouth of the pit serves three main purposes: 1) it is a point of transfer from pit trucks to crushed-ore tractor trailers; 2) it reduces the size of ore from mine-run to minus-1½-in. for direct feed to the rod mill; and 3) it provides storage space.

The crushed-ore haul, from primary crushing plant near the pit to storage bins at the concentrator, is 2½-mi. at a 3% grade. Eight diesel tractor trucks and five 24-ton bottom-dump trailers are used.

Milling—Three-Way Separation

Since milling operations started in 1931 (at 150 tons daily) the plant has changed several times. A few of the influencing factors were change from underground to open-pit mining, discovery of tungsten ore, and changing demand for gold, antimony, and tungsten.

In the past, successful flotation of Yellow Pine ores was complicated by varying degrees of oxidation. As the pit became deeper, the ore became less oxidized and easier to treat. Recoveries improved.

The present 2,400-ton concentrator is the result of a remodeling job completed in 1946.

Bulk-sulphide flotation is rather difficult because a compromise pH range must be used. Pyrite and arsenopyrite float best at a pH of 9.5, and stibnite at 6.8. A compromise of 8.4 gives good recovery of both in a bulk concentrate.

The Smelter—It Completes the Chain

Principal factors which influenced Bradley's decision to build a smelter were these:

1) There was a limited market for antimony concentrates even during periods of high metal prices.

2) Existing smelters had difficulty in recovering Yellow Pine's metal values from the complex concentrates.

3) Transportation of concentrates was very costly.

Actual construction, begun in June 1948, followed two years of experimental work conducted jointly by Bradley and the metallurgical department of the Bunker Hill smelter.

Smelting operations were started late in 1949. Cost of the completed smelter, as it now stands and including the cost of a six-month period for process development, was more than $2.5-million.

Briefly, the smelter operation starts with antimony and gold concentrates from the mill.

Roasting oxidizes the concentrates and reduces sulphur and arsenic content.

Blending prepares the charge for the electric furnace.

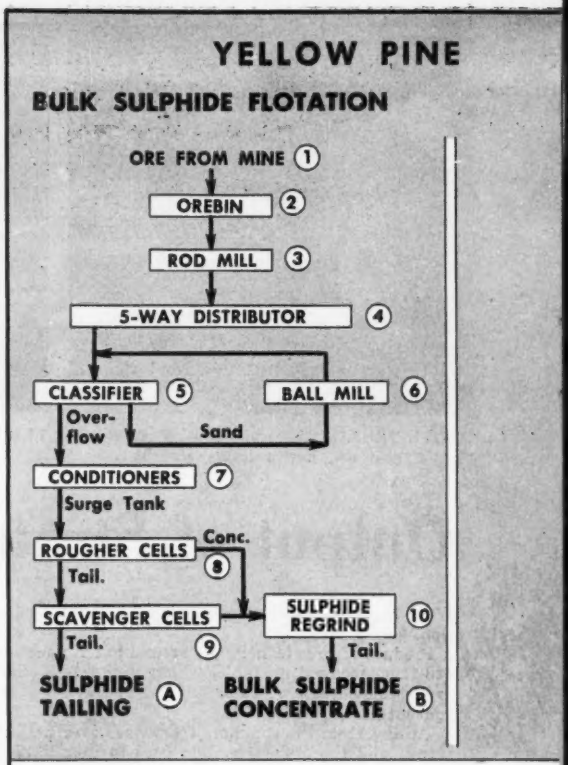
Electric smelting reduces antimony, copper, lead, gold, and silver to metals.

Refining removes the iron and arsenic.

Converting oxidizes the refined antimony, producing two products: Antimony oxide and a residue which contains the other base and precious metals.

ROASTING

Gold concentrate is fed to an eight-hearth 21½-ft. Herreshoff roaster at the rate of 1.3 tons per hour. Because it is self-roasting, the only fire is a small oil burner on hearth 8. Temperatures range from 700 deg. F. on hearth 1, to 1,350 deg. F. on hearth 7. Highly acid gas comes from hearths 1 to 4 at 750 deg. F., passes through a hot cyclone, then to pipe cooling towers 75-ft. high, and is filtered in a Nor-Blo automatic baghouse.



LEGEND

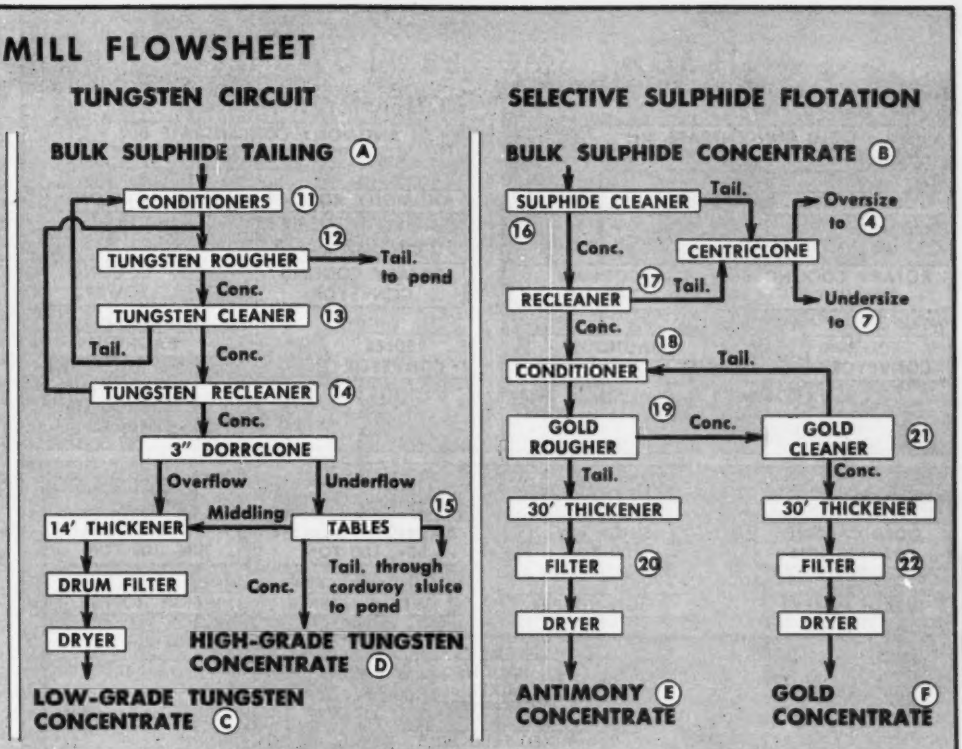
BULK SULPHIDE FLOTATION

1. About 2,500 daily tons ore from mine crusher plant; minus 1½-in.; 1.0% antimony; 0.08 oz. gold; 1 oz. silver; up to 0.20% tungstic oxide.
2. 3,000-ton truck bin.
3. 9½ x 12' Marcy rod mill. Product: 96% minus 10 mesh. Rod consumption: 1.25 lb. per ton.
4. 5-way distributor.
5&6. Five ball mill-classifier circuits. Product: 97% minus 48 mesh. Ball consumption: 1.85 lb. per ton.
   8' x 6' Marcy — 72" screw
   8' x 48" Hardinge — 60" screw
   8' x 48" Hardinge — 60" screw
   8' x 48" Hardinge — 60" screw
   8' x 36" Hardinge — 72" Dorr Duplex
7. Three 8 x 8' conditioners.
8. Two parallel banks rougher flot. cells.
   First bank: 2 @ 48" Agitair, then 8 @ 56" Fagergren.

Calcine from the roaster goes by rotary cooling conveyor and bucket elevator to storage bins in the smelter building.

Antimony concentrate is fed to a 10-hearth by 21½-ft. Herreshoff roaster at the rate of 1.7 tons per hour. A burner is operated on hearth 10. To avoid fusion, the temperature on the first five hearths must be held below 780 deg. F. In succeeding hearths, temperature rises to a maximum of about 1,020 deg. F. About

MILL FLOWSHEET



Second bank: 2 ● 48"Agitair, then 12 ● 56" Fagergren.

9. Scavenger flotation: 2 ● 48" Agitair, then 12 ● 56" Fagergren.
10. Sulphide regrind circuit. Product: minus 200 mesh 5 x 8" ball mill — 72" Dorr Duplex

REAGENT FEED: 0.7 lb. soda ash and 0.5 lb. caustic soda for pH control; 0.20 to 0.25 lb. Z-11 as collector; 0.4 to 0.75 lb. lead acetate to activate stibnite; 0.25 to 0.4 lb. copper sulphate to activate pyrite and arsenopyrite.

pH: 8.4

TUNGSTEN CIRCUIT

11. Two 8 x 8' conditioners
12. Tungsten rougher cells: 8 ● No. 44 Pan American, then 6 ● 48" Agitair; all in series
13. Tungsten cleaner cells: 2 ● 48" Agitair
14. Tungsten recleaner cells: 4 ● 24" Agitair
15. Two Diagonal-Deck tables, Deister Concentrator Co.

REAGENT FEED: 1 lb. sodium silicate; 1.5 lb. Aerosoap

SELECTIVE SULPHIDE FLOTATION

16. Sulphide cleaner: 4 No. 24 "Sub-A"
17. Sulphide recleaner: 4 No. 24 "Sub-A"
18. Two 8 x 8' conditioners
19. Gold rougher: 5 ● No. 44 Pan American
20. 5 x 8' drum filter.
21. Gold cleaner: 4 ● No. 44 Pan American
22. 5 x 6' drum filter.

REAGENTS: copper sulphate, caustic soda

ANTIMONY CONCENTRATE	GOLD CONCENTRATE
900 tons per month	1,100 tons per month
Gold, 2.50 oz.	Gold, 0.60 oz.
Silver, 3.0 oz.	Silver, 17.0 oz.
Antimony, 4%	Antimony, 46%
Arsenic, 9%	Arsenic, 1.8%
Sulphur, 35%	Sulphur, 22%

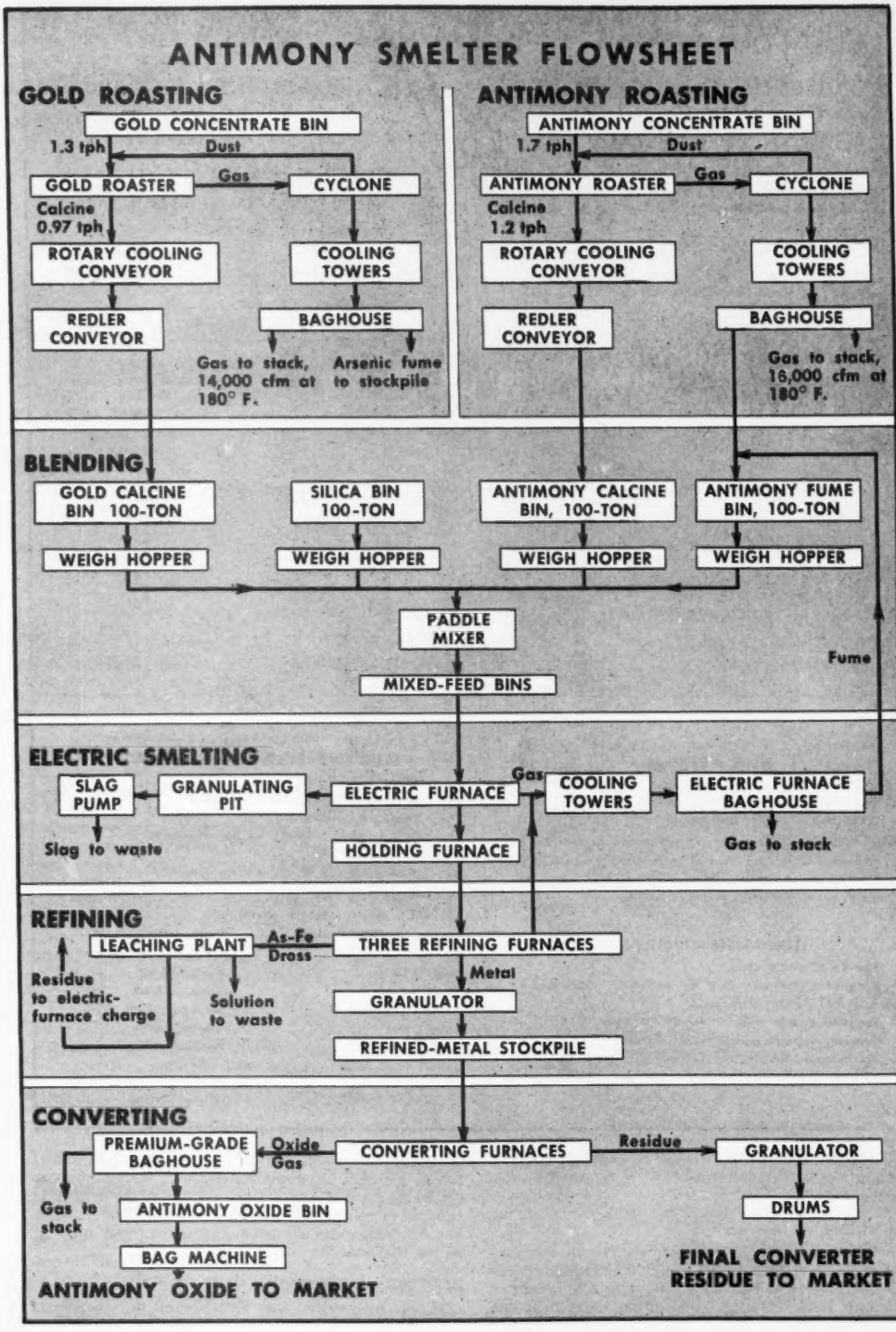
75% of the contained antimony remains in the calcine and the remainder fumes off. Gas escapes from hearths 1 to 5.

BLENDING

In the smelter building proper, overhead steel bins contain gold calcine (1.5% sulphur), antimony calcine (antimony, mostly as Sb_2O_4, with 2% sulphur), antimony fume (Sb_2O_3), coal, silica, soda ash, and secondaries. Each bin is connected to individual weigh hoppers by screw conveyors. Weigh hoppers discharge into a batch type paddle mixer which is capable of mixing 12 tons of charge per hour. Each blended charge is elevated and discharged into an 80-ton bin near the electric furnace.

ELECTRIC SMELTING

When the smelter was first broken in, the metal-


ANTIMONY SMELTER FLOWSHEET
GOLD ROASTING
GOLD CONCENTRATE BIN
1.3 tph
Dust
GOLD ROASTER
Gas
CYCLONE
Calcine
0.97 tph
ROTARY COOLING CONVEYOR
COOLING TOWERS
REDLER CONVEYOR
BAGHOUSE
Gas to stack, 14,000 cfm at 180° F.
Arsenic fume to stockpile
ANTIMONY ROASTING
ANTIMONY CONCENTRATE BIN
1.7 tph
Dust
ANTIMONY ROASTER
Gas
CYCLONE
Calcine
1.2 tph
ROTARY COOLING CONVEYOR
COOLING TOWERS
REDLER CONVEYOR
BAGHOUSE
Gas to stack, 16,000 cfm at 180° F.
BLENDING
GOLD CALCINE BIN 100-TON
SILICA BIN 100-TON
ANTIMONY CALCINE BIN, 100-TON
ANTIMONY FUME BIN, 100-TON
WEIGH HOPPER
WEIGH HOPPER
WEIGH HOPPER
WEIGH HOPPER
PADDLE MIXER
MIXED-FEED BINS
Fume
ELECTRIC SMELTING
SLAG PUMP
GRANULATING PIT
ELECTRIC FURNACE
Gas
COOLING TOWERS
ELECTRIC FURNACE BAGHOUSE
Slag to waste
HOLDING FURNACE
Gas to stack
REFINING
LEACHING PLANT
As-Fe Dross
THREE REFINING FURNACES
Residue to electric-furnace charge
Solution to waste
Metal
GRANULATOR
REFINED-METAL STOCKPILE
CONVERTING
PREMIUM-GRADE BAGHOUSE
Oxide Gas
CONVERTING FURNACES
Residue
GRANULATOR
Gas to stack
ANTIMONY OXIDE BIN
DRUMS
BAG MACHINE
FINAL CONVERTER RESIDUE TO MARKET
ANTIMONY OXIDE TO MARKET

lurgy department ran head-on into a major difficulty. The trouble involved iron: Slag from the furnace had to be held at 6 to 7% antimony in order to keep iron in the bullion at about 6 to 7%. And not only was 6 to 7% iron in the bullion considered too high for efficient refining, but also the loss of antimony in the slag was too high.

Solution by R. J. McRae and Harold E. Lee came during a period of testing from April 1 to June 1, 1951. They found the trouble was high arsenic content of the charge which somehow caused selective reduction of iron. The arsenic came into the charge in the antimony fume portion.

Their solution involved 1) smelting the high arsenic portion of the charge with a deficiency of coal or reducing agent, and thus allowing a low iron fall to the antimony but a rather high antimony content of the slag; and 2) smelting, in the next step, a charge made up only of antimony calcine and gold calcine low in arsenic; sufficient coal is added to reduce the contained antimony as well as that held in the slag of the first charge.

This new system might be described as a continuous batch smelting, as opposed to continuous feeding of the charge to the electric furnace.

Original Furnace Charge

Product	% of Total	% Arsenic	% Antimony
Gold Calcine.....	15	0.5	3.0
Antimony Calcine....	45	1.5	45
Antimony Fume.....	30	20	60
Secondaries	10	....	....

Current practice is to charge the electric furnace after a slag tap with 30 tons of under-reduced charge; this is high in arsenic content, and is made up of gold calcine, antimony calcine, and antimony fume. This is followed by 10 tons of over-reduced charge; it has a low arsenic content, and is made up of gold calcine, antimony calcine, and excess coal (no antimony fume). Then the charge is melted, and slag is tapped.

Metal taps are made as needed, about every 6 hours. Slag is tapped at the rate of about 1 ton per minute into a granulating pit, and is then pumped to the disposal area; temperature ranges from 2,180 to 2,250 deg. F. Metal temperature ranges from 1,700 to 1,800 deg. F.

Under the new system, the smelting rate is as high as under continuous feed, the furnace metal fall has increased from 52 to 71%, antimony in the final slag has dropped from 7 to 2%, and iron in the final furnace metal from 7 to 3%. In the under-reduced cycle, metal assays 1% iron, and slag 12% antimony.

The Lectromelt furnace was designed for a maximum input of 2,000 kva and operates at a 0.97 power factor. Its three 24-in. electrodes are in a straight line, spaced 48 in. between centers; phase voltage can be varied between 80 and 130 v. Power input is adjusted to about 360 to 380 kw per ton of charge.

The furnace hearth is 7 ft. 3 in. by 17 ft. A 9-in. invert holds about 12 tons of metal. The invert and side and end walls up to the slag line are lined with magnesite brick.

REFINING

Purpose of refining the bullion is to remove iron to the limit of 0.05% and arsenic to 0.10%. Used for refining are three 5 x 7-ft. oil-fired reverberatory furnaces each of which holds 9 tons of metal.

In refining, the metal is brought up to 1,600 deg. F., 400 lb. of caustic flake is added, and the bath is air lanced until the caustic sets into a pasty dross. An operator, using a wooden hoe, skims off the dross through the working door. This cycle is repeated until the metal assays less than 0.10% arsenic, at which time the iron is down to less than 0.05%.

It takes about 16 hours to refine 8 tons of metal; and it requires about 3½ lb. of caustic for each 1 lb. of metal refined.

The dross contains about 18% antimony, 14% arsenic, 17% iron. It is water leached. The residue, containing about 85% of the antimony and only 7% of the arsenic, is returned to the electric furnace.

Refined metal is granulated and, ready for converting, sent to stockpile.

CONVERTING

Converter Products

	Refined Metal (Feed)	Primary Residue (Inter)	Final Residue (Product)	Ratio Product to Feed
Gold	5 oz.	52 oz.	250 oz.	50
Silver	50 oz.	500 oz.	2,500 oz.	50
Copper	0.6%	4%	20%	33
Lead		1.5%	6%	.....
Antimony ..	98.5%	88%	68%	0.69

The table above tells the story of converting. Antimony metal is burned off, oxidized to Sb_2O_3, and leaves gold, silver, copper, lead, and a remainder of antimony in a primary residue. The residue in turn is saved, and reburned until it is about 50 times as rich in gold and silver as the original refined metal.

Two identical oil-fired furnaces of local design are used for converting. On each, four stainless-steel tuyeres project into the sidewalls.

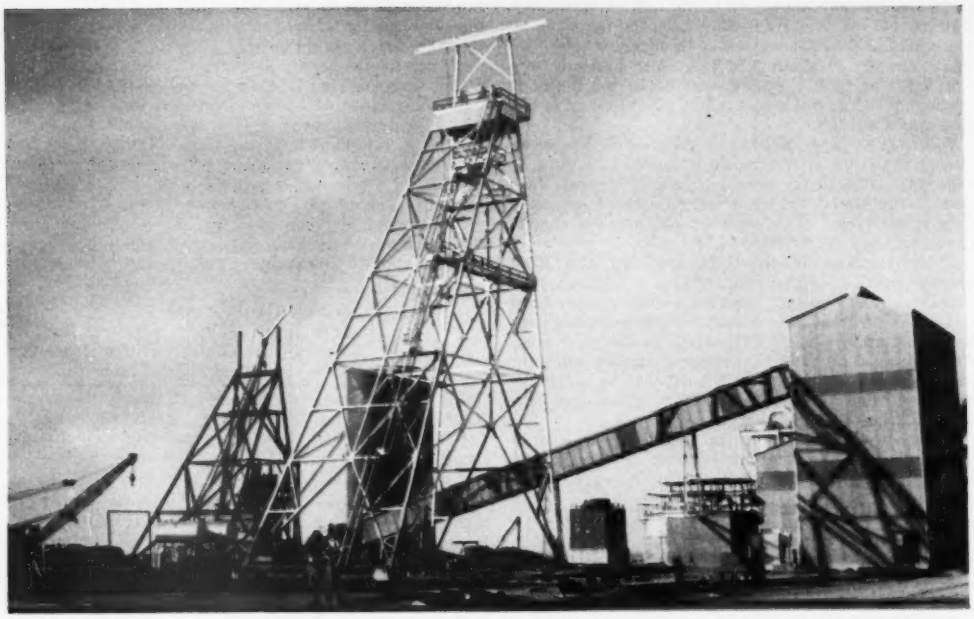
Granulated metal, charged continuously through the arch of the furnace, maintains the metal bath at 10-in. of depth. Capacity of each is determined by the volume of low-pressure air supplied to the tuyeres; under normal conditions, each will make up to about 12 tons of oxide per day.

Gas leaves through an outlet in the center of the arch. Four adjustable openings in the escape flue provide for bleeding in quench air. The gas is first quenched at the furnace throat to about 750 deg. F., and is then quenched to 220 deg. F. before entering the premium oxide baghouse. Collected premium oxide is bagged in valve-type paper bags by a St. Regis bagging machine. Each unit of 20 bags, after being checked for color and after testing of each 5-ton sublot for color, tinting-strength and impurities, is ready for sale.

Primary converter residue, in the amount of 10% of the day's metal feed, is withdrawn every 24 hours. About every two weeks, it is burned down into final residue—until the oxide turns a yellow color. This oxide goes to the metal-grade baghouse. The final residue is granulated and barreled for shipment to the United States Smelting, Refining and Mining Co.

Since all current smelter production is saleable as oxide, reduction of oxide to metal is done only on the off-color oxide. It is done about once each month in a furnace identical to the refiners. The charge consists of oxide mixed with 3% soda ash and 10% coal. Reduced metal is granulated in 8-ton batches, and is ready for sale as metal.

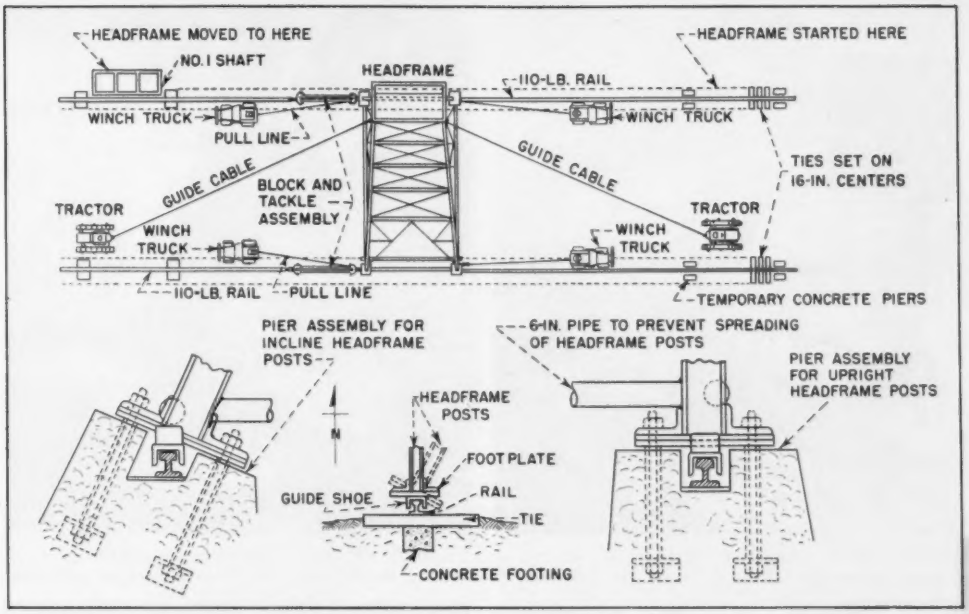
Though the smelter has reached its capacity of 6,000 tons of antimony a year, a number of changes are under way which will increase recovery and production. Under construction is an addition to recover antimony and gold from the gold roaster fume; calcium arsenate will be a byproduct.



THE SHAFT, for Duval's new potash mining project in the Carlsbad, N.M. district, is under the sinking headframe at left. Permanent headframe at right is all ready to slide over into place when space is cleared for it.

How To Move a Headframe—

ON ITS WAY, headframe starts 80-ft. trip to new foundations on greased 110-lb. rails. Note old foundation piers in foreground. Entire moving job took less than three hours, went off in line with carefully-arranged management plan.



JOB WAS HANDLED by four winch trucks, two Caterpillars, arranged as shown. Two trucks pulled headframe from right to left: other trucks and tractors steadied headframe, acted as brakes. Note details of foundation piers.

and Why

For a faster shaft-sinking job, consider Duval Sulphur & Potash Co.'s idea of building the permanent headframe at one side, then sliding it into place when shaft is completed. Saved them six weeks and much expense.

IT'S A WASTE OF TIME in opening a new mine, to sink the shaft with a temporary sinking headframe, then work furiously to get the permanent headframe built after the shaft is completed. Duval Sulphur & Potash Co., opening up a new potash mine near Carlsbad, N.M., worked out a faster and less expensive method.

They simply built the 130-ft. headframe, weighing about 190,000 lb., on a temporary site 80 ft. away from the point where the No. 1 shaft was being sunk. When the shaft was ready, the sinking headframe was torn down, and on Feb. 11, 1952, the permanent headframe was moved over to its foundations and bolted down.

Doing the job this way not only permitted a more careful, unhurried construction of the big headframe; it saved an estimated six weeks in getting the shaft into production.

The method used is explained in accompanying photographs and drawings. Engineering problems involved were worked out by Frank DeHoff, job superintendent, who also directed the actual moving operations.

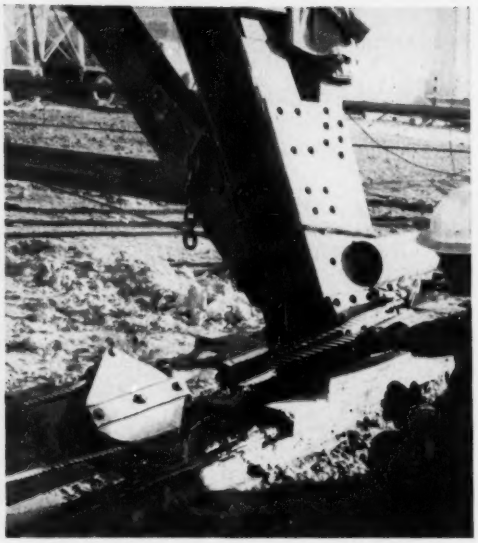
The headframe made the 80-ft. trip, from its temporary to its permanent foundations, on two 110-lb. rails resting on wooden ties laid down on 16-in. centers. The rail beds were carefully leveled, and the fill was thoroughly compacted with a Jackson vibrator. A concrete footing, varying in depth up to 12 in., was placed in the center of each bed under the ties, as shown in the sketch at the top of this page.

Each of the 4-ft. plates on the headframe posts was equipped with a welded-on steel guide shoe, which slid along on the rails. To keep the posts from spreading, and to help stabilize the whole structure, 6-in. pipes were welded between the headframe posts a short distance above the footplates.

It took four winch trucks and two Caterpillar tractors to move the headframe. They were arranged as shown in the plan of the

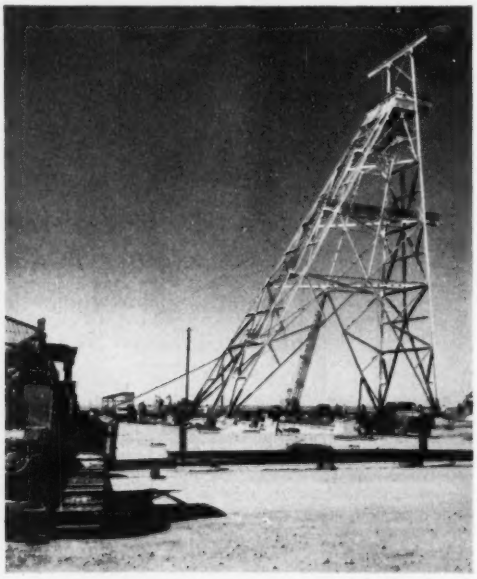
Photographs by Robert Nyseyer, Carlsbad, N.M.

WINCH TRUCK takes in on pull line; crew prepares to move tackle ahead. Note pier ready in foreground.



HEADFRAME POSTS slide on guides on rails. Note end of 6-in. pipe at right that keeps posts from spreading.

MOVING COMPLETED, post rests on pier seen in photo above; crew is installing long anchor bolts in foundation.



ALL SET, headframe is ready for sheaves. Shaft is 1,558 ft. deep, will handle 2,500 tons of potash ore daily.

sketch. Two winch trucks pulled the frame ahead by taking in on the pull lines of the block and tackle assemblies attached to the western posts of the headframe. The other two trucks put their lines on the eastern posts to act as brakes. Two guide cables, run from the tractors to the upright posts, steadied the headframe during the moving job.

It was estimated the job would take three hours. Actually, the men began work at 7:45 and completed the job without a hitch a little before 10:45 a.m.

Duval Sulphur & Potash Co. is headed by G. F. Zoffman, president. Eugene German is vice president, W. P. Morris is resident manager, G. E. Atwood is assistant resident manager and refinery superintendent, and J. E. Tong is mine superintendent.

LEON E. JOHNSON, locomotive operator, talks by the two-way trolley telephone system to his brother, Thomas F. Johnson, dispatcher, in TCI's Ishkooda ore mines. The compact, combined receiver-transmitter has speeded communications, provided better safety, and increased mine efficiency. Any interruption can be reported at once.

Trolley Haulage Speeded by Better Communication

UNUSUAL DELAYS in rerouting locomotives have been eliminated by U. S. Steel's Tennessee Coal, Iron & Railroad Division in its ore mines at Birmingham, Ala., through the use of a carrier current telephone intercommunication system. The adoption of two-way trolley phone units on all locomotives, in the dispatcher's office, the rotary dumps, and maintenance shop allows for instant communications. It has proved a great timesaver, increased safety, and made for more efficient operations and ore hauling.

Installation of the underground communication system was another step in the complete modernization of TCI ore mines. FM transmitters and receivers were first installed in Ishkooda No. 11, one of the company's nine mines on Red Mountain. Plans are progressing to install the same system in all other ore mines.

The system as installed is compact, easy to operate and low in maintenance cost. A transmitter-receiver, built in one unit, is installed in each of the mine's four mainline locomotives—one each in the dispatcher's office, rotary dumps, underground maintenance shop motor pit, and one on the locomotive for the material-handling crew. There are three spares also.

The units operate on 100-kilocycle frequency modulation, drawing power off the trolley wire. The current passes through a voltage divider, giving 120 v. to the transmitter and 35 v. for the receiver.

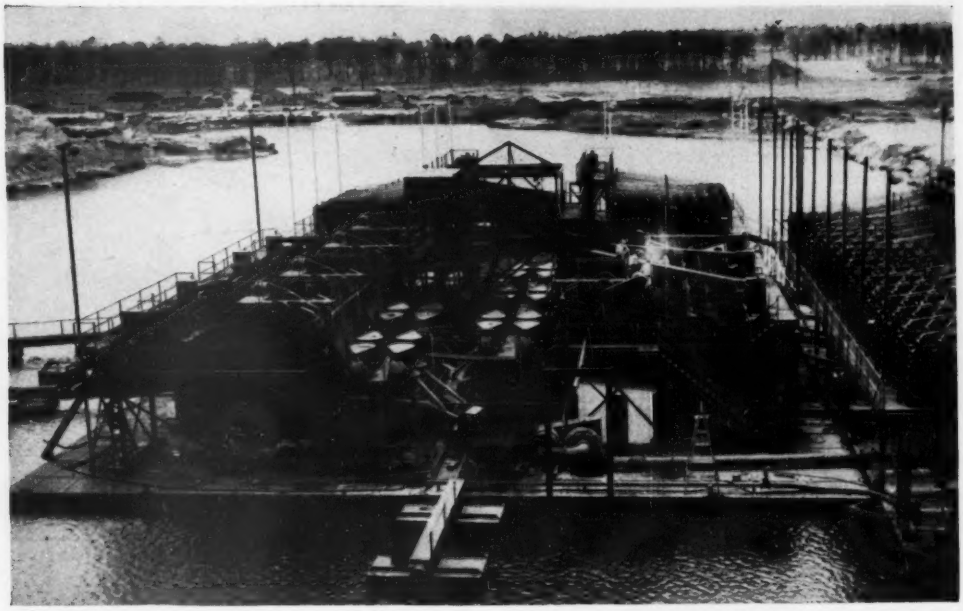
The new system not only gives the dispatcher much better control over locomotives, but allows the motor operators to talk to each other as well as to the dispatcher.

TCI officials emphasize that the new intercommunication system does not replace the block signals which are used on all mainline haulageways.

Time saved is considerable and the instant communication to any station or locomotive is in sharp contrast to the old system of telephones located only at strategic points and working areas in the mine.

Under the old system it was necessary, in some cases, for an operator to walk a considerable distance to the nearest telephone to report trouble. In other cases where there was a breakdown, considerable time was lost in rerouting either to the rotary dump or to a different loading area. Frequently the party line was busy and reporting or dispatching was delayed.

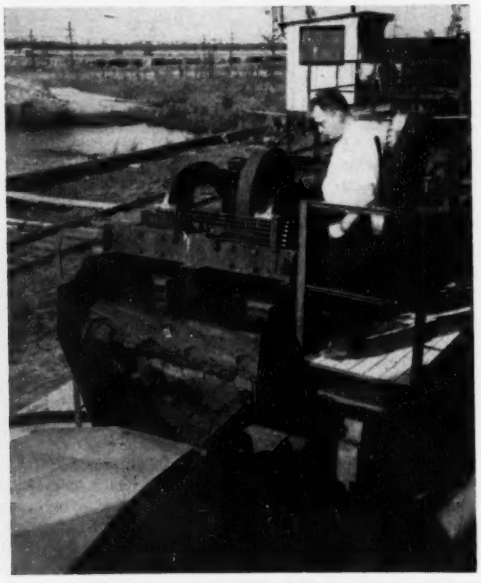
The system as installed is that of the Farmers Electric & Manufacturing Co., Pittsburgh, using trolley phone Model 2700 for operations on 100 kc. frequency modulation. It consists of combined receiver and transmitter. Each station is equipped with a "press-to-talk" microphone and words spoken into any one microphone are heard over all other speakers.



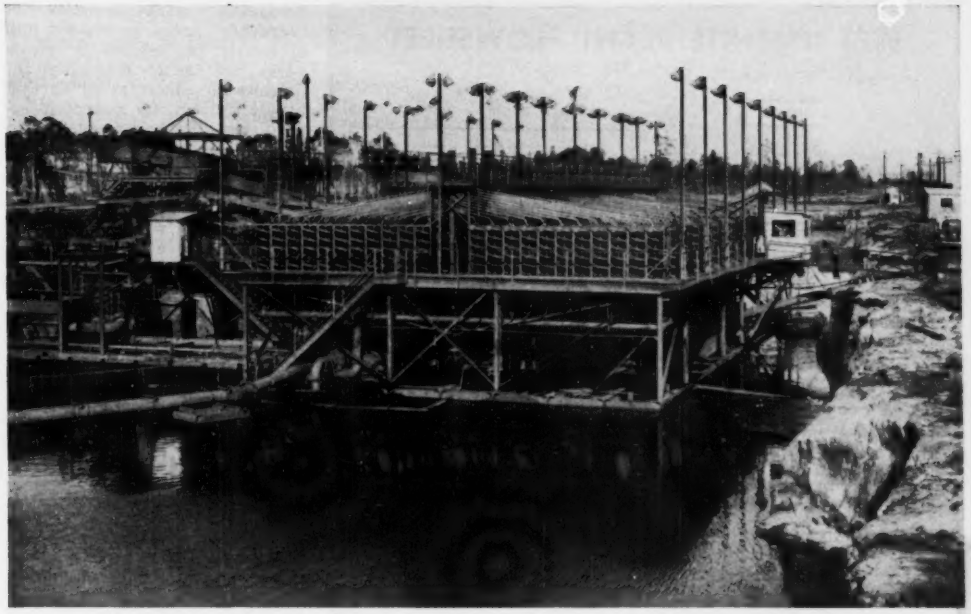
CONDITIONER BARGE of DuPont ilmenite plant carries dredge for wet concentration on spirals. In background equipment for washing and dewatering feed received from are cleaner spirals. Rougher barge at right.

Florida Sands Boost Supply

C. R. HAGER, plant superintendent, watching the operation of some of the five-turn spirals.



J. C. DETWEILER, technical superintendent, at one of the dewatering classifiers.



ROUGHER SPIRAL BARGE carries 704 first-stage five-turn spirals. Pump on bottom deck supplies wash water to spirals. A rougher concentrate, middling and tailing are made. Tailing is dumped back into pond.

# of Titanium Mineral

DuPont is getting 100,000 tons of ilmenite annually from large-scale operation near Starke.

LARGE-SCALE MINING and beneficiation operations at its Trail Ridge deposit of sands containing heavy minerals near Starke, Fla., 40 mi. southwest of Jacksonville, are providing E. I. duPont de Nemours and Co., Wilmington, Del., with a continuous supply of ilmenite that reduces the company's dependence upon world sources of this mineral. Humphreys spirals, and electromagnetic and high-tension electric separators are employed in the beneficiation process.

Conducted for DuPont by the Humphreys Gold Corp., of Denver, Colo., the operation is turning out about 100,000 tons a year of ilmenite in addition to smaller amounts of zircon. The zircon is processed by the Humphreys company for its own account.

Ilmenite is the principal raw material for making titanium dioxide and, more recently, titanium metal. It is the DuPont company that announced, in 1948, the first small-scale commercial production of titanium in metallic form.

The successful exploitation of the Florida deposit is a tribute to the resourcefulness and ingenuity of American industry. Whereas the black sandy beach near Quilon on the southwest coast of India, an important source of ilmenite, is 75% ilmenite, the Starke deposit contains less than 2%. It was only after the development of the Humphreys spirals that commercial operation was possible.

Bureau of Mines Discovery

Discovery of the ilmenite deposit near Starke was made during a nation-wide survey undertaken by the U. S. Bureau of Mines. The area shows little surface indication of the presence of ilmenite. The mineral is found in varying quantities from the Starke area to the Georgia boundary line.

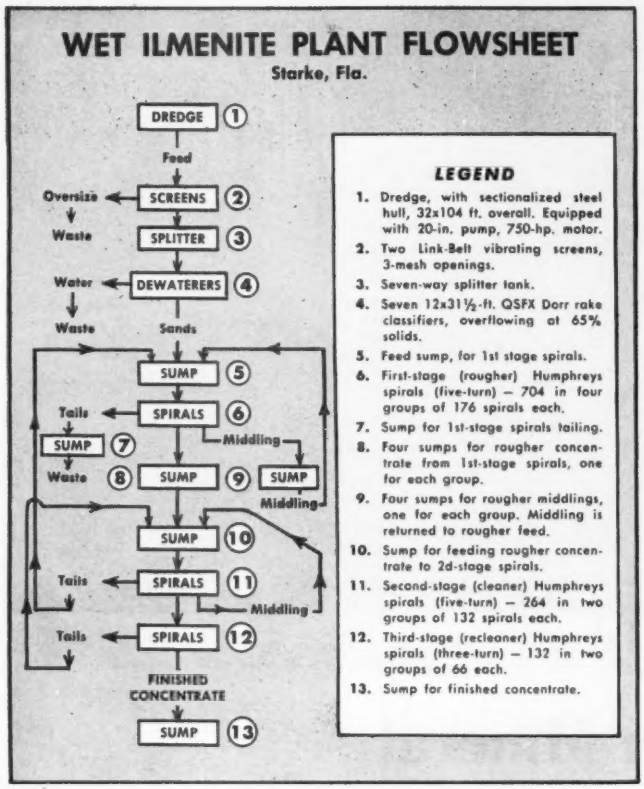
The first work was done by drive-pipe sampling. Later the Bureau devised a drill to take samples below the water level. These confirmed the earlier prospecting. Later, engineers of the DuPont and Humphreys companies developed a better drill. This consisted of a 1½-in. EX drill casing with a jet pipe inside, which has worked efficiently.

TiO_2 Content Varies

The Deposit. The sands in the Starke area are largely silica, the titanium oxide content averaging 1.3%. Grain size is mostly minus-48-mesh. The mineral has been found at depths of 20 to 70 ft., the average being 35 ft. Varying amounts of hardpan are encountered and it is customary to break this up by drilling with light rigs and blasting ahead of the dredge.

In the particular area being worked the sampling gave results ranging from 2 to 10% of heavy mineral, this varying from hole to hole with no segregation of values in any large area.

In general the grade is lower


WET ILMENITE PLANT FLOWSHEET
Starke, Fla.
DREDGE 1
Feed
Oversize
SCREENS 2
Waste
SPLITTER 3
Water
DEWATERERS 4
Waste
Sands
SUMP 5
Tails
SPIRALS 6
Middling
SUMP 7
Waste
SUMP 8
SUMP 9
SUMP
Middling
SUMP 10
Tails
SPIRALS 11
Middling
Tails
SPIRALS 12
FINISHED CONCENTRATE
SUMP 13
LEGEND
1. Dredge, with sectionalized steel hull, 32x104 ft. overall. Equipped with 20-in. pump, 750-hp. motor.
2. Two Link-Belt vibrating screens, 3-mesh openings.
3. Seven-way splitter tank.
4. Seven 12x31½-ft. QSFX Dorr rake classifiers, overflowing at 65% solids.
5. Feed sump, for 1st stage spirals.
6. First-stage (rougher) Humphreys spirals (five-turn) — 704 in four groups of 176 spirals each.
7. Sump for 1st-stage spirals tailing.
8. Four sumps for rougher concentrate from 1st-stage spirals, one for each group.
9. Four sumps for rougher middlings, one for each group. Middling is returned to rougher feed.
10. Sump for feeding rougher concentrate to 2d-stage spirals.
11. Second-stage (cleaner) Humphreys spirals (five-turn) — 264 in two groups of 132 spirals each.
12. Third-stage (recleaner) Humphreys spirals (three-turn) — 132 in two groups of 66 each.
13. Sump for finished concentrate.

CONCENTRATE from wet plant, at right, is delivered by stacker belt to outdoor stockpile near dry mill, at left. Clamshell transfers it to feed bins.

near the surface and higher near the bottom, averaging from 2 to 4% heavy mineral and following no pattern. The TiO_2 content of the heavy mineral varies from 28 to 33%. Depth of ore varies from 20 to 70 ft., with the average around 35 ft. The ore bottom itself has no particular pattern. Numerous peaks, valleys and ridges are encountered in its irregularities.

Plant Design. Designing of the plant started in February, 1948, actual construction beginning in May of the same year. The plant went into operation in April, 1949, and has operated continuously with only a temporary shutdown for a few changes.

The plant comprises a floating dredge; a floating conditioner, or "scrubber" barge, in the wet mill operation; the separating spirals barge; and the dry mill where the ilmenite is concentrated further by electromagnetic and high-tension electric separators.

Land Cleared To Start

The Mining Operation. The first step in mining was to dig a huge dry pit with a dragline. Steel barges were then built in this pit to support the wet mill and were later floated. Water to fill the pit was supplied from three 16-in. wells, 800 ft. deep, which deliver approximately 2,000 gpm, using 14-in. Deming deep-well pumps.

The land was cleared of all marketable trees for lumber, then for pulpwood. The stumps were used for pine oil and tar products. Following this, the company cleared the surface of roots and other debris with LeTourneau root rakes and root dozers. Stripping and screening were impractical because of the presence of roots and stumps of an ancient forest 5 or 6 ft. under the surface. This led to the development of a "root hog" which reduces the sticks and wood to chips so that they will pass through the dredge pump and can be removed at the barge trash screens.

Mining by Dredge. The dredge is a 20-in. suction unit equipped with a revolving steel cutter. The boat is a steel sectionalized barge designed by Greenville Manufacturing Co., Greenville, Ohio, and constructed on the job. It is equipped with a 20-in. American Manganese Steel pump and a 750-hp. Westinghouse motor. The barge is 32 ft. wide, 104 ft. long overall, and is 6 ft. deep, drawing about 4 ft. of water.

Material is pumped at 10 to 15% solids through a 24-in. steel line to the wet mill, a distance varying up to 800 ft. About 20 tons of solids is handled per minute with 16,000 gpm of water. When the line reaches its maximum distance, the wet mill, floated on barges, is moved closer to the dredge.

The "traveling lake" on which the dredge floats is about ½ mi. long and 500 ft. wide and is maintained with an area of about 16 acres. It moves forward with the operations, the dredge taking the sand out at the forward end, the heavy minerals being removed in the wet plant, and the discarded sand used as backfill at the rear of the lake.

Wet Plant on Pond

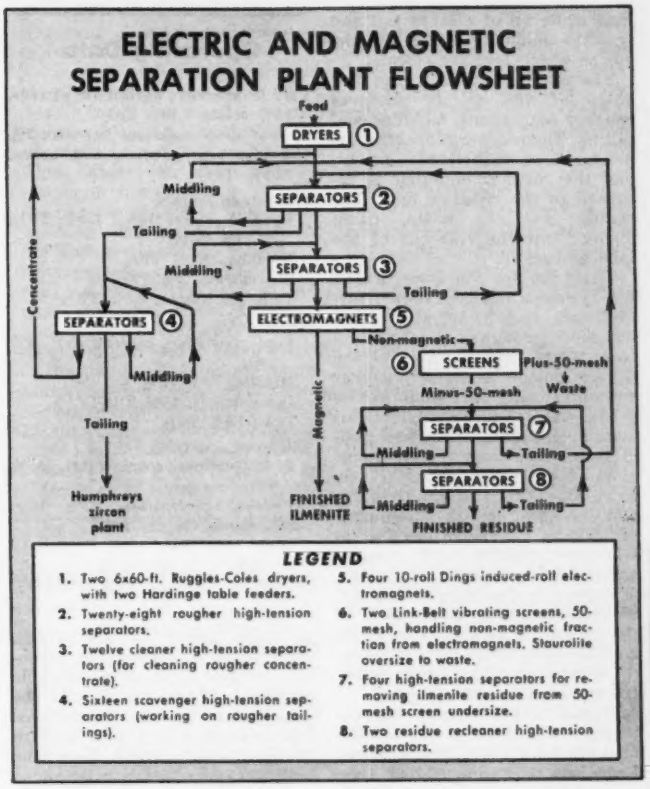
Three Sections on Barges. The wet plant is mounted on three steel sectionalized barges constructed of pontoons of the type used during World War II to construct docks. The barges are tied together, but are flexible to allow for vertical movement, as the amount of mined material being processed on each barge varies from time to time. All piping between the barges has flexible connections.

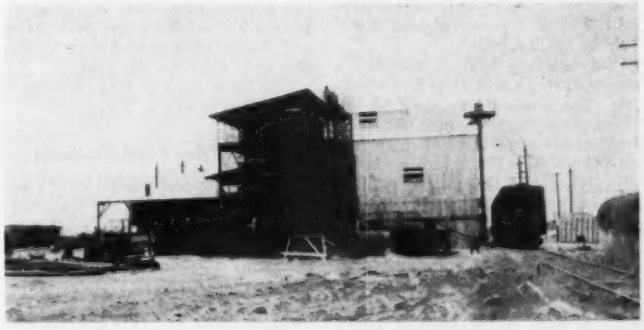
The wet plant consists of the conditioner barge, 100x107 ft. in dimensions, made up of 224 pontoons; the rougher barge is 62x126 ft. in size and has 176 pontoons, and the 67x95-ft. cleaner barge has 134.

On the conditioner barge is the washing and thickening equipment, including screens and rake classifiers. The rougher barge carries the first-stage separation equipment. On the third portion of the floating plant the last two stages of the work of preparing the concentrate before delivering it to the final washer and to stockpile are carried out. The total number of spirals in the three stages is 1,100, consisting of 968 five-turn spirals and 132 three-turn.

During this stage of the process the organic material coating the grains is removed and the heavy, black mineral is separated from the sand by the spirals.

Concentrate from the wet mill runs about 27% titanium dioxide. Of this concentrate 80% is heavy minerals containing 45% titanium minerals, and 15% zircon. The remaining 40% of the heavy minerals, composed of 4% kyanite, 5% sillimanite, 20% staurolite, 5% tourmaline, and 6% miscellaneous, has no commercial value. The other 20% of the concentrate is sand. Of every ton of material dredged, approximately 2% is titanium mineral, of which 70% is recovered.





ZIRCON MILL recovers zircon from wet plant rougher tailing. It is operated by Humphreys Gold Corp. for its own account.

Feed Prepared for Spirals

Screens and Classifiers. About 1,100 long tons of material is delivered per hour by the dredge to two Link-Belt three-mesh vibrating screens over which less than 1% of the sand is lost. The oversize goes to waste and the undersize to the seven-way splitter tank from which the material is fed to seven 12x31½-ft. QSFX Dorr rake classifiers.

Classifier feed is about 15% solids in the total flow of about 18,000 gpm feed. This is changed to 65% solids, with part of the overflow, about 8,000 gpm, going to waste as slimes.

The rake product is split through two sumps and is diluted to 30-35% solids by water from the classifier overflow for feed to the Humphreys spirals.

Each of the two sumps has a 16-in. Amsco pump of 7,500 gpm capacity to feed a total of 352 five-turn spirals in two groups of 176 each, or a combined total of 704 spirals in the four groups.

The 1,100 long tons delivered hourly by the dredge is about 70% of the 1,590 tons total spiral feed. The remainder is the circulating

load made up of cleaner tail and rougher middling going to the sumps which feed the spirals.

The rougher circuit in the first stage of 704 spirals produces rougher concentrate, middling and tailing. The rougher concentrate is delivered to the cleaner circuit, and the rougher middling is returned to the rougher feed. The tailing goes to waste, being dumped into the rear end of the lake as backfill.

There are five 4-in. Georgia Iron Works pumps and one 6x6-in. Allis-Chalmers, each of 500-gpm capacity, in the rougher middling and concentrate circuit. Three of the G.I.W. pumps transfer rougher concentrate and the remaining two G.I.W. units and the Allis-Chalmers pumps transfer rougher middling to the main transfer sumps.

An 8-in. Nagle pump (Nagle Bros. Mfg. Co., Chicago Heights) and one 10-in. Amsco pump, each of 2,000 gpm capacity, are used to transfer middling and concentrates for recirculation.

Tailing in the rougher circuit, which constitutes about 65% of the 1,590 tph feed, goes to waste and is disposed of by one 14-in. G.I.W. and one 16-in. Amsco pump, the two handling 15,000 gpm.

Second Stage. Rougher concentrates are pumped to the cleaner feed bin by an 8-in. Nagle pump. From here they go to a 12-in. Amsco 2,000-gpm pump which feeds 264 five-turn spirals in two groups of 132 each. The spiral feed is 600 tph at 30-35% solids.

Second-stage spirals produce a concentrate, a middling and a tailing. The concentrate goes to the third-stage spirals, consisting of two groups of 66 three-turn spirals or 132 spirals. The middling is recirculated and the tailing returned to the rougher circuit.

Third stage. The third stage produces a finished concentrate running 27% TiO_2. This is pumped to the dry mill by a 4-in. Nagle 600-gpm pump, through a 4-in. line with a 4-in. Nagle booster pump every 1,000 ft. The maximum distance is 4,000 ft.

Third-stage tailing is recirculated to the second stage. The feed to the third stage of about 70 tph is 25% solids and flows by gravity to the third-stage spirals.

Dewatering. The third-stage concentrate is pumped ashore at 25% solids and 30-45 tph to the concentrate dewatering plant. This has a 5x23-ft. DSFH Dorr classifier where the concentrate is dewatered, after which it is scrubbed at 65% solids in six 4x4-ft. Humphreys scrubbers. The scrubbers remove some of the organic coating to reduce the dust in the subsequent dry mill operations. The dewatered pulp then goes to another 5x23-ft. DSFH Dorr rake with 250 gpm of wash water added and is dewatered to discharge onto the stacker belt. This is equipped with a Fairbanks-Morse belt scale and delivers the concentrate to the stockpile near the dry mill.

The material has 16% moisture and is left to dry to 7%.

Operating Data

Feed from dredge to vibrating screens, 15% solids, 1.30% TiO_2
Loss of sand on screens less than 1%
Classifier rake product, 65% solids, 1.30% TiO_2
First-stage spirals
- **Rougher spiral feed, 1.4% TiO_2, 30-35% solids**
- **Middling, 1.8% TiO_2**
- **Concentrate, 4% TiO_2**
- **Tails (to waste), 0.3% TiO_2**

Second-stage spirals
- **Feed (rougher concentrate), 4% TiO_2**
- **Middling, 5% TiO_2**
- **Concentrates, 15% TiO_2**
- **Tails, 1.5% TiO_2**

Third-stage spirals
- **Feed (cleaner concentrate), 15% TiO_2**
- **Finished concentrate, 27% TiO_2 25% solids (to dry mill)**
- **Tails, 10% TiO_2**

Dry Mill for Final Products

Spirals Concentrate Dried. From the outside stockpile, the material is picked up by a 1½-cu. yd. Link-Belt clamshell bucket and dumped into two 100-ton steel bins and dropped to two Hardinge table feeders and then to two 6x60-ft. Ruggles-Coles dryers, coal-fired by stokers. The temperature ranges between 250 and 300 deg. F. Feed to each dryer is about 35 tph at 93% solids and 7% moisture.

From the dryers the material is fed by two Link-Belt oscillating feeders and bucket elevators directly to the screw conveyor for distribution to 28 rougher high-tension electric separators. These were developed from electrostatic-type separators by J. H. Carpenter and Humphreys Gold Corp., but have a comparatively high flow of current between electrode and rotor. They produce a concentrate, a middling, and a tailing.

The concentrate goes to 12 cleaners for further concentration. This material is delivered to magnetic separators; the middling is recirculated in the cleaner circuit; and the tailing is returned to the rougher circuit.

Rougher tailing goes to 16 scavenger high-tension separators, to produce a concentrate which is returned to the rougher circuit. The middling is recirculated within the scavenger circuit. Scavenger tailing is sent to a plant producing zircon nearby.

Cleaner concentrate goes to four 10-roll Dings induced roll electromagnets having five rolls per side. The magnetic fraction is ilmenite. The nonmagnetic fraction goes to two Link-Belt vibrating screens with 50-mesh cloth which rejects staurolite to waste as oversize. The undersize goes to four cleaner high-tension separators and the concentrate to two recleaner separators which produce an ilmenite residue, largely leucoxene.

Tailing from the recleaners goes back to the cleaners and the cleaner tailing is recirculated back to the rougher head feed.

Final products are stored in 100-ton steel bins from which they are loaded by elevator conveyor into 70-ton closed railroad hopper cars for shipment to the DuPont plants for processing. Production is about 100,000 tons of shipped product per year out of something over 6 million tons of mined material.

The high-tension separators in the dry mill operate at 40,000 v. with 15 milliamperes across a 4-in. field from the electrode to the steel roll.

Operations Unusual

The Trail Ridge operations are most unusual in many respects. The content of ilmenite in the sand is so low that 10 years ago there was no known method of extracting it on a commercial basis. Only the development of the Humphreys spirals has made it possible.

The DuPont company's investment has contributed substantially to the establishment of a continuous domestic source of ilmenite. Many improvements have been made since the work began.

For example, rubber has proved to outlast any of the originally installed iron alloy pumps by several times the life, with reduced maintenance cost. A 6x6-in. Allis-

Chalmers pump on the rougher-concentrate transfer service has proved very effective. Rubber is being used to line the launders and to replace steel pipe and to reduce abrasion of the spirals.

Additional knowledge has been gained in hydraulic jet drilling, blasting, and in the development of equipment for root grinding.

The discovery of the ancient forest and the "hard pan" created problems in operation that had to be solved. The hard pan is a local name applied to layers of consolidated or cemented sand caused by resins and fatty acids which are decomposition products of pine trees and possibly other vegetation. Breaking this for easier dredging was found most effective by shooting the face with Nitramon blasting agent with millisecond delays. Holes are dug with an hydraulic jet rig on 20-ft. centers to 50-ft. depths.

Research and operating studies have continued since the plant went into commission. Some changes have been made but not of any major proportions. A Hagen Ring Balance flowmeter was installed in the dredge to indicate the number of tons of sand mined per hour. This makes it easier for the dredge operator to maintain a more uniform rate of delivery to the wet plant. The average tonnage mined is about 1,100 per hour, averaged for about 20 hours operation per day on three shifts.

The plant maintains an operating force of about 225 employees.

As a means of insuring purity of discharge water that is returned to creeks, the company has installed a $40,000 treatment plant. Waster water goes to a settling pond where it is treated to cause the organic solids to settle. Lime is added before the water is discharged into the creek. Treatment is automatically controlled by pH meters. The plan has been approved by the Florida State Board of Health.

Plant operation is directed by Jay P. Wood, vice president and general manager, Humphreys Gold Corp. Other officials include E. C. Weichel, Jr., plant superintendent, DuPont; C. J. Bastedo, plant engineer; W. J. Siprelle, production superintendent; G. R. Mathews, mining superintendent; W. C. Coran, spirals superintendent; P. K. Klaustermeyer, assistant spirals superintendent; V. A. Nichols, superintendent of dry mill; Charles Devlin, welding superintendent; and J. C. Detweiler, technical superintendent.

Remedy Sought for Mica Shortage

JOSEPH C. ARUNDALE
Commodity-Industry Specialist
U.S. Bureau of Mines
Washington, D.C.

DOMESTIC PRODUCTION OF SHEET MICA in 1951, as for years past, represented only a small percentage of consumption. However, a shortage of sheet mica enlivened the interest of domestic producers, actual and potential. Prices advanced but were not high enough to allow domestic producers to compete, in most cases, with low-cost foreign output. Prices of imported sheet mica continued to rise throughout the year, and consumers made many complaints about the quality of the material being received. Supplies of Indian muscovite splittings and Madagascan phlogopite splittings were adequate for industry's needs and national stockpile requirements. The present purchase objective for muscovite and phlogopite splittings for stockpile was met during the year. Condenser film is still in short supply.

Exploration of domestic pegmatites in search of sheet mica and other strategic minerals was assisted by the provisions of the Defense Production Act of 1950, as a result of which exploration loans were made available. More than a score of mica projects were approved, with loans ranging from a few hundred dollars to several thousand dollars each. Many more were being considered by DMEA. Work on approved projects had not progressed far enough to permit evaluation of results.

Numerous meetings were held with domestic mica producers, processors, and consumers by various government agencies. As a result, the government is formulating a domestic mica program that takes into consideration the economic factors that help make such a program workable from the operator's standpoint and with respect to production of mica of strategic grade.

At the year end, this program had not begun to function, but steps were being taken to provide the organization and facilities it would need. It was expected that actual purchases might be made in the first quarter of 1952. A program designed to encourage foreign producers of strategic grades and qualities of mica also was prepared.

By General Overriding Regulation 9, issued by the OPS and effective May 1, 1951, sales of raw mica and mica parts were exempted from price control. Inasmuch as the great bulk of raw sheet mica consumed in the United States is imported, no effective control over prices could be exerted.

Two firms were reported to be planning to produce commercially a mica paper or a built-up mica from scrap mica. This is to be substituted for much of the built-up mica that is being made from splittings imported from India. The two companies are expected to use similar processes. In general these consist in delaminating scrap mica and recombining the flakes by taking advantage of the ability of freshly delaminated flakes to cohere under certain conditions. Sheets are then formed in a machine.

A potential substitute for sheet mica is a glass film that is being made by a domestic glass producer. This would take the place of scarce condenser film.

In consequence of the development of a power factor meter with a grid electrode, there was new interest in the electrical testing of mica as a conservation measure.

Production of scrap and ground mica continued to increase. Acceptance of this material for paints and other purposes is growing. Some new scrap producers and grinders entered the field and several operations were extended.

Some progress was made in research on the synthesis of mica. A fluorine-phlogopite type has been crystallized, although suitable sheets have not yet been produced. A "byproduct" of this work is a "hot-pressed mica" suitable for certain types of electrical insulators.

This article was accidentally omitted from *E&M.J.*'s Annual Survey and Outlook Number, February, 1952.

Leaching with Niter Cake

. . . has proved a cheap, effective way of recovering copper from oxide ores

FERNANDO BENITEZ
Gerente General (President)
Fundicion Nacional de Paipote, Ltda.
(National Smelting Company of Paipote, Ltd.)

SULPHURIC ACID is both scarce and expensive in Chile. Many operators have found that niter cake is a good substitute for acid in the leaching of oxide copper ores. And niter cake is not only cheap, it is also available.

What is Niter Cake?

It is the residue or byproduct obtained in the production of sulphuric acid by the chamber process when sodium nitrate is attacked by sulphuric acid. This residue is a mixture of sulphate and bisulphate of sodium (Na_2SO_4 and $NaHSO_4$). It is a white salt and contains about 33% of free sulphuric acid.

Sources of Cake

- Tronador dynamite plant at Calama, very near to the Chuquicamata mine, supplies most of Chile's small leaching plants with niter cake. Tronador is a Du Pont subsidiary which manufactures blasting powder.
- Braden has a sulphuric-acid plant which employs the chamber process. In the flotation of its ores, Braden uses about 5 lb. of acid per ton of ore, and processes about 27,000 tons of ore per day.
- Andes Copper also has a sulphuric-acid plant, but it has been down for the last two years.

A Gold-Copper Plant

The first mill to employ niter cake as a solvent for copper ores was the Hochschild mill at Copiapo, capital of Atacama Province. This mill (25 tons per day) was designed to treat gold ores containing up to 1% soluble copper.

To save cyanide, the soluble copper was first leached in a countercurrent circuit, and the gold ore was then passed on to cyanidation.

Ore was ground in water to 80% minus-200 mesh. Classifier overflow went to a Dorr thickener. Pulp leaving the thickener, at a water-solid ratio of 1.5 to 1, went to the leaching circuit—three Dorr agitators in series—where it was mixed with niter cake solution.

Leaching solution was prepared in a small wooden tank. Niter cake and water were added in proportions which yielded a concentration of 150 grams of H_2SO_4 per liter. An airlift in the tank provided circulation. The leaching solution was then fed to the agitators as required.

In the three Dorr agitators, copper minerals dissolved almost instantaneously even though acid concentration was very low.

Copper sulphate from the agitators went to precipitation on scrap iron, and the barren solution was discarded.

Pulp from the agitators was then washed by countercurrent decantation in five Dorr thickeners. From them it went to a 6x6-ft. agitator where lime was added to neutralize the remaining acid. The copper-free pulp then went to a conventional cyanide circuit.

A Typical Copper Plant

When a short ton of 65% cement copper went up to $520 in Chile several small copper-leaching plants were built. Such plants beneficiate the low-grade oxide ores (3 to 5% copper) which are abundant in the many small mines of Antofagasta Province—either in dumps, fillings, or ore in place.

The typical method consists of two-stage leaching in a batch process. Two or more leaching vats are necessary. Fresh ore is leached with the copper-acid solution from the second stage of leaching. Pregnant solution is taken from the leaching of fresh ore. In the second stage of leaching, acid content is held high so that copper extraction will be complete.

A typical plant of 50 to 100 tons capacity per day is equipped about like this: There are four leaching vats, each of 35 tons capacity, built of concrete with walls protected by mastic or asphalt. Each vat is equipped with two airlifts to accelerate solution. For storage and transfer of solution, a 25-cu.-m. tank is placed below each vat. Solution is drained from the ore into this tank and is then pumped by an acid-resistant pump to the next stage.

Flow is like this: Two vats are paired, and the ore stays in the same vat during leaching, but solutions are transferred from one to the other to give a countercurrent result. Fresh ore is charged to vat No. 1. About 4,000 lb. of niter cake is spread on top of the ore before solution is introduced. Copper-rich solutions, arriving from vat No. 2, contain about 30 grams of copper and about 10 grams of acid per liter. The airlifts are started.

In about four hours, all the niter cake has been dissolved. In about 24 hours, nearly all of the acid has been consumed and the concentration of copper has risen to 60 or 70 grams per liter.

The pregnant solution is withdrawn and goes to large precipitating tanks. Preferred agent for precipitation is cut tin plate; it gives a cement containing about 75% copper. To accomplish precipitation in 24 hours' time, it is necessary to use five times as much iron as the amount of copper to be precipitated. Example: Fifteen cubic meters of copper solution contain 900 kilograms of copper (15 x 60); so 4,500 kilograms of iron (900 x 5) would be used. Precipitated solutions are always wasted to prevent too strong a concentration or possible saturation of sodium sulphate. Saturation would lead to crystallization of sodium sulphate in vats and pumps.

In the meantime, ore in vat No. 2 has been given the second leach. It is washed with water, and the washing solution containing 5 to 6 grams of acid per liter, is charged to the partially leached ore in vat No. 1. About 4,000 lb. of niter cake is added to the top of the ore. During final leaching, acid concentration is adjusted for maximum dissolution, and is held at about 10 grams per liter.

When leaching is complete, the solution is drained, pumped onto a fresh charge of ore in vat No. 2. The ore in vat No. 1 is washed, and is then discharged to make way for a new batch.

A complete cycle for each vat takes between four and five days.

Because of low solution temperatures and other factors, during the winter months copper solution going to precipitation is lowered to about 50 grams per liter; acid concentration is never greater than 20 grams per liter.

A Better Way To Prepare, File, And Index Mine Maps and Drawings

THOMAS E. GILLINGHAM, Geologist[1]

BUNKER HILL & SULLIVAN Mining & Concentrating Co.'s well-ordered map system was designed to provide: (1) standard sizes and layouts; (2) a useful method of filing sheets horizontally with protective covers; (3) a simple index. It was worked out primarily for the geological department, but has been so satisfactory that several other companies in the Coeur d'Alenes have adopted it also. Helpful suggestions have been made by R. H. McConnel, Bruno Ebel, Austin Park, Earl Phillips, and Walter Simon, all of the Bunker Hill staff.

A Basic Need—Standard Sheet Sizes

Modern mine drafting practice favors relatively small sheets for maps and drawings. For a large area, it is now customary to divide the area into blocks for large-scale details, and to cover the entire area by a smaller-scale map on a single sheet of about the same size as the block sheet.

A convenient size system is the one based on the unit 8½ by 11-in. standard letter sheet: Selections made from multiples of this unit size will be suitable for almost any type of drawing or map. In the left-hand column of Table I are listed small-case letters, hereafter referred to as "size letters." These letters designate the unit 8½ by 11-in. sheet and multiples thereof; also, several special or miscellaneous sizes such as federal topographic sheets, patent claim plates, etc. If for some reason a standard sheet other than a multiple of 8½ by 11 in. is adopted, one of the extra letters can be applied to it.

After sheet sizes have been selected from Table I, they should be listed on placards displayed in the drafting office and file room. Thereafter, all drafting work should be done on selected sheet sizes only.

Advantages of this system are:

1. A print or drawing of any multiple of the standard unit size can be folded to 8½ by 11 in. evenly, and then placed in a standard letter file or an envelope bound with a typewritten report. Sizes *a*, *b*, and *c* can be bound in the body of the report. Thus the mine geologist can carry folded or evenly divided prints underground in his conventional aluminum mapping board for use as work sheets or for delivery to the underground foreman. At Bunker Hill, for example, in mapping surface geology on 200 scale by Brunton and tape, a 34 by 44-in. (size *h*) base map print is cut into quarters, each 17 by 22 in. (size *d*), and each quarter is then folded to 8½ by 11 in. for the field notebook.

2. Certain combinations of multiple sizes, used with common mapping scales, provide systematic subdivision or block coverage of a given area. At many American and Canadian mines, scales of 1 in. to 50 ft., 1 in. to 200 ft., and 1 in. to 1,000 ft. are used for mine and geologic maps. Using these scales, a 34 by 44-in. (size *h*) sheet with a 2-in. all-around margin covers an area measuring 1,500 by 2,000 ft. on 50 scale, 6,000 by 8,000 ft. on 200 scale, or 30,000 by 40,000 ft. on 1,000 scale. Each 50-scale block of size *h* can be reduced to a 200-scale block of size *a*, covering the same mapped area with adequate margin, and each 200-scale block of size *h* can be reduced to a 6 by 8-in. map on 1,000 scale, which nicely suits an 8½ by 11-in. (size *a*) sheet for notebook or report.

3. Standard size sheets can be cut from regular 24 or 36-in. rolls of paper or tracing cloth without much wastage. In fact, the wastage provides a convenient margin for construction notes and pen tests.

4. This size system lends itself readily to the filing and indexing schemes described below.

Sheet size chosen for a system of block maps of a mine or of a surface area depends upon the ultimate area to be covered and the purpose of the maps. There is much to be said for the small sheet for the survey base maps on large scale, particularly if the mine or area is large. Size *d* (17 by 22 in.) with 1½-in. bottom and left margins and ½-in. top and right margins, will cover an area 750 by 1,000 ft. on 50 scale. This is about the minimum size for a block map. For 50-scale geological block maps the size *h* (34 by 44 in.) sheet with 2-in. all-around margin is convenient. Four size *d* survey blocks cover the same area as a single size *h* geological block.

How To File Maps

A good filing system is orderly, compact, and protects maps and drawings in storage. It must be flexible, expandable, and the individual sheets should be readily accessible. Files should not be too costly.

A file that meets the above requirements and costs less than drawers or metal cabinets consists of a series of plywood or tempered masonite boards of suitable sizes arranged horizontally in wooden racks or cabinets. Boards large enough to accommodate sheets up to 34 by 44 in. (size *h*) can be handled satisfactorily; larger boards are impractical.

After standard sheet sizes for board filing have been selected from Table I, appropriate boards must be obtained. Recommended board sizes and details of board construction are shown in Figs. 1 and 2. Boards may be made for each sheet size chosen from sizes *b* to *h* inclusive, but it is possible to combine two sizes of a common short dimension on boards designed for the greater of the two long dimensions. This merely reduces the variety of boards and racks; it does not mean that more than one sheet size should be filed on any particular board. For example, in a rack holding, say, 20 boards designed for size *g* sheets, 10 of the boards may be reserved for size *f* sheets and the other 10 for size *g* sheets. As the file expands it may be desirable to provide separate racks for each size of sheet and to use additional board sizes. Sheets may be transferred from one board to another and boards may be transferred from one rack to another as the need arises.

Fig. 1 shows that all sizes of boards are similar in construction. The masonite or plywood is cut to the overall dimensions L and W for the size board

(*Continued on page 91*)

[1]Formerly Geologist for Bunker Hill & Sullivan Mining & Concentrating Co.; now Staff Geologist, Raw Materials Division, Atomic Energy Commission.

Tables and figures below tell how the filing system works.

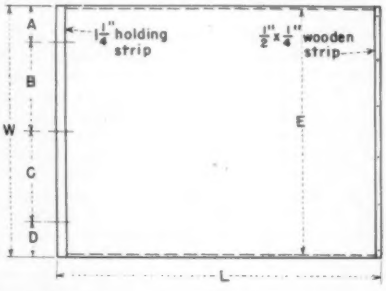
Table I—Table of Sheet Sizes

Size Letter	Short Dimension	Long Dimension	Unit Area Multiple
a	8½	11	1 (Unit Area)
b	11	16½	2 (approx.)*
c	11	24½	3 (approx.)*
d	17	22	4
e	17	33	6
f	25½	33	9
g	25½	44	12
➡ h	34	44	16
i	34	55	20
j	Special size for flat filing		
k	Special or miscellaneous size for flat filing		
m	Special or miscellaneous size for flat filing		
n	Special or miscellaneous size for flat filing		
p	Special or miscellaneous size for roll filing		
q	Special or miscellaneous size for roll filing		

* Note that sizes *b* and *c* are made exceptions to the strict multiples of the unit area. This makes it possible for these sizes to be folded once or twice, respectively, to form the unit 8½ by 11 in. dimensions with a ½ in. margin for notebook holes.

THESE TWO TABLES are the key to the Bunker-Hill filing system for maps and drawings. Table I lists sheet sizes for all maps and drawings. Note that the standard sizes are multiples of the unit area, 8½x11-in.

Table II lists symbols used to classify all subjects covered by maps and drawings prepared by the various departments of the company. These two tables are posted in convenient places to guide draftsmen, engineers, and others in the preparation of maps and drawings that can be filed and classified readily for future reference.



For Sheet Size	Board Overall Dimensions		Board Special Dimensions				
	L	W	A	B	C	D	E
b	18½"	12½"	2"	4¼"	4¼"	2"	12"
c	26½"	12½"	2"	4¼"	4¼"	2"	12"
d	24"	18½"	2¾"	6½"	6½"	2¾"	18"
e	35"	18½"	2¾"	6½"	6½"	2¾"	26½"
f	35"	27"	5"	8½"	8½"	5"	26½"
g	46"	27"	5"	8½"	8½"	5"	26½"
➡ h	46"	35½"	5"	12¾"	12¾"	5"	35"

FIG. 1. MASONITE OR PLYWOOD boards are cut to dimensions shown here. Small letters conform to standard sheet sizes listed in Table I. These boards fit into cabinets constructed as shown in Fig. 3.

Table II—Subject Categories

Symbol

GEOLOGY DEPARTMENT

A Assays, Ore Reserves, Production Figures

➡ **G Geology Maps**

X(G) Miscellaneous Drawings and Notes of Geology Department

MINING ENGINEERING DEPARTMENT

C Claims, Property, Litigation Maps
Right of way, municipal divisions, etc.

P Surface Plant Layout—excluding mechanical and structural designs.
General arrangements of buildings, dams, pipe lines, power lines, etc.

T Topographic Maps
Contour maps, federal and state topographic, forest, and general aerial maps.

U Underground Plant Layout—excluding mechanical designs.
General layouts of hoist rooms, pumping stations, sumps, pockets, track, projected development, etc. Also mining engineers' designs of chutes, timber framing, truck curves, etc.

V Mine Ventilation—excluding mechanical designs.
Airflow maps and charts.

➡ **W Workings**
The regular underground survey maps by mine surveyor.

X Miscellaneous Drawings and Notes of Mining Engineering Department

ELECTRICAL DEPARTMENT

E Electrical Drawings
Wiring diagrams, alarm and signal systems, transformer stations, electrical equipment.

X(E) Miscellaneous Charts, Drawings and Notes of Electrical Department

CONSTRUCTION AND MECHANICAL DEPARTMENT

B Surface Plant Designs—Buildings and Structures.
Floor layouts, foundations, structural details.

F Flowsheets for Milling Plant—excluding mechanical designs.
General layouts of milling machinery, experimental flowsheets, etc.

M Mechanical Drawings
Details of machinery and equipment for surface, mine and mill.

X(M) Miscellaneous Charts, Drawings, and Notes of Mechanical Department

SUBDIVISIONS OF E AND M CATEGORIES

E(B) or M(B) Electrical or Mechanical Drawings of Surface Plant
Details of electrical or mechanical installations to be placed in surface plant, excluding milling plant.

E(F) or M(F) Similarly for Milling Plant

E(U) or M(U) Similarly for Underground Plant

Note: The (X) category or subcategory is reserved for those notes and drawings of each department that cannot be filed conveniently elsewhere. For example, the X(G) sheets might include drawings of map symbols, dip correction charts, slope charts, rock-type charts, color symbols, etc.

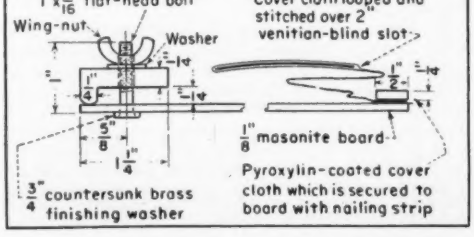


FIG. 2. (Right) DETAILS OF MASONITE FILE BOARD. Note the cover cloth which keeps the drawings clean.

Arrows correlate related details in examples shown.

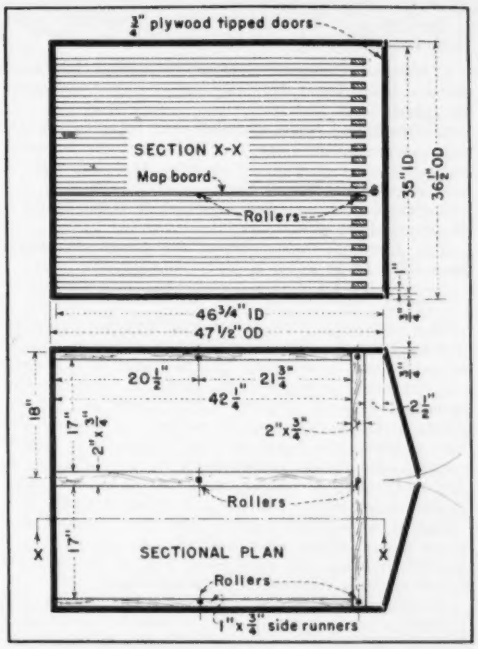


FIG. 3 (Left) THIS CABINET is designed for size "h" boards. Rollers permit boards to be removed easily.

TITLE ABC Mining Co.
Shoshone County, Idaho
CONTACT MINE - 200 LEVEL

NO. → GW 106.3 h

SCALE 1" - 50'

TYPE: Tracing Cloth

BY: John Jones DATE: 6-13-51

REMARKS: Geology by John Jones 5-8-51
Map based on transit survey by John Doe 5-1-51

FIG. 4. PRIMARY WHITE CATALOG CARD filed in the "Geology" drawer. Meaning of "GW 106.3 h" is as follows: G means that the drawing is primarily a geologic map. "W" means that the drawing also shows mine workings and should therefore be cross-indexed under "Workings." Number "106" is the board and sheet number telling where the board is filed, and ".3" is a decimal indicating the sequence of the sheet on the board. Letter "h" indicates that the drawing is a 34x44-in. sheet to be filed in a cabinet holding "h-size" sheets. A duplicate card on buff paper will be cross-filed in the "Workings" drawer.

ABC Mining Company		Shoshone County, Idaho		REVISIONS			
CONTACT MINE - 200 LEVEL							
SCALE 1" = 50'	COORD. Contact	DATUM U.S.G.S.					
SURVEY BY John Doe	DATE 5-1-51	DRAWN J.J.	DATE 5-13-51			DRAWING NO.	
GEOLOGY BY John Jones	DATE 5-8-51	TRACED	DATE			→ GW 106.3h	

FIG. 5. STANDARD TITLE BLOCK appearing on the map which is indexed on card in Fig. 4. Note that the important subject in large letters is the name of the mine, and not the company. Text tells why.

(Continued from page 89)

desired. For example, a board for size *e* sheets is cut to 35 by 18½ in. The smooth side of the board is then given one or two coats of white enamel.

Special dimensions A, B, C, and D refer to spacings of 3/16-in. holes drilled along one edge of the board. Fig. 2 shows arrangement of holding strip and bolts. The wooden holding strip is L-shaped in cross-section, so that, when tightened down by means of the wing nuts, the inner edge of the strip will grip the sheets tightly; this shape also facilitates insertion of the sheets.

Cover flaps, of lightweight artificial leather, are cut to width shown as dimension E in Fig. 1. One edge of the cover flap is looped and sewn over a 2-in. steel Venetian blind slat which gives partial rigidity to the edge and enables it to be inserted easily under the holding strip. With this edge held tightly against the holding bolts, the opposite edge of the cover flap is secured to the board by means of a ½ by ¼-in. wooden strip nailed in place.

Sheets are slotted on the left-hand margin so that the slots fit precisely over the holding bolts. If this slotting is done carefully, a series of sheets can be inserted in perfect alignment, and any single sheet

FILE LEDGER

BOARD NO. G106h

SHEET NO.	TITLE	SCALE	BY	DATE
G106.1h	Contact Mine-Surface Geology	1"=50'	J.J.	5-21-51
106.2	" " -100 Level Geology	1"=50'	J.J.	5-25-51
→ 106.3	" " -200 " "	1"=50'	J.J.	6-13-51
106.4	" " -300 " "	1"=50'	J.J.	6-14-51

8½" x 11"

106.38	Gold Seam Tunnel-Geology	1"=100'	F.H.H. 6-20-51
106.39	Baker Mine-Surface Geology	1"=200'	B.S.T. 6-21-51
106.40	" " -Composite Geology	1"=200'	B.S.T. 6-21-51
	— This Board Filled —		

FIG. 6. A LOOSE-LEAF LEDGER SHEET is kept for each board. This sheet shows how the map referred to in Figures 4 and 5 is recorded in the file ledger.

can be withdrawn and replaced without removing other sheets from the board. The cover flap holds down the edges of the sheets and protects them from dust and dampness.

The boards are filed in racks, or cabinets. See Fig. 3 showing a standard Bunker Hill cabinet made of plywood boards and softwood slats. It holds 20 of the largest size boards with at least 400 sheets of size *h* mounted on them. Features of this large cabinet, not needed in the smaller sizes, are the slats in the centers of the support panels and the inserts in the panels with small steel rollers to aid movement of the large boards. In each panel are six rollers, three in front, and three midway towards the back. Vertical space is saved by placing the front support slats about 2 in. inwards from the front of the cabinet, thus allowing room for the holding strip and wing nuts. Doors can be added to the cabinet, if desired.

Smaller cabinets are essentially boxes with wooden runners placed at proper vertical intervals to support the boards along the sides only.

In any mine office there arises inevitably the problem of how to handle odd sizes of sheets from old or outside sources. If a file of old maps is inherited, subjects and sizes may be heterogeneous, yet the contents are more or less valuable. Old maps are generally in rolls, and if fragile should, perhaps, be kept in rolls. Some odd sizes, however, can be trimmed to, or nearly to, standard sizes and filed on boards.

Rolled sheets can be filed in 2-in. dia. cardboard tubes of two different lengths, for *p* and *q* lengths of rolls, respectively. The tubes are held in wooden frames built in such a way that each tube is secured by two horizontal and two vertical members of the frame. Or, the rolled sheets can be filed in a pigeonhole type of cabinet, having 4 by 4-in. or 5 by 5-in. compartments, again of suitable lengths. With pigeonholes, the sheets can be rolled on wooden sticks and secured by rubber bands or string. The sticks, about ¾-in. in dia. and as long as the pigeonholes, hold the sheets in position, and the ends, painted white, provide a convenient index label.

Odd-size flat sheets are best stored in shallow drawers of two or three sizes, to accommodate sheet groups *j*, *k*, *m*, and *n*. Many prints, particularly those from equipment manufacturers, can be folded and filed in standard manila folders, which are included in size *a* file along with standard 8½ by 11-in. notebooks.

How To Index Maps

The index is coordinated with the systems of size designation and filing described above. It provides for segregation of sheets by general subject and by size within that subject, so that, as the mine organization expands into several departments, each department can take over all maps and drawings relating to its functions. In a large mining company there may be a geology department, a mining engineering department, and a mechanical-electrical department, each handling certain categories of drawings and maps. The operating departments—mining, milling, smelting, construction, etc.—are serviced, insofar as design and drafting are concerned, by the aforementioned technical departments. Even in a small organization there are obvious advantages in having maps and drawings grouped by general subject. A typical departmental breakdown of subject cognizance is shown in Table II. Capital letters in the left-hand margin of this table are the "Subject Category Symbols."

Each map or drawing carries a three-part index or drawing number consisting of:

1. Subject Category Symbol—a capital letter or letters from Table II, indicating subject category or categories.

2. Board and Sheet Number—an integer indicating the particular board (or tube, drawer, or compartment) and a decimal showing the sequence of the sheet on the board.

3. Size Letter—a small case letter from Table I, denoting sheet size.

The complete index shows the above sequence, thus GCT 2.5 h, P 5.3 b, M(U) 40.11 d, etc.

Index Number Is Key to Classification

The first part of the index, the "Subject Category Symbol," denotes general subject or subjects included on the map or drawing. The first symbol is always the "Controlling Symbol" for filing. It indicates the principal general subject of the sheet, as, for example, geology; the general subject division of the file in which the sheet will be found; and, consequently, the departmental cognizance of the sheet. Any additional symbols indicate merely subject categories under which the sheet is cross-indexed. The "Controlling Symbol" must come first; cross-index symbols are added alphabetically, as many as are needed to bring the subsidiary subject matters on the sheet into reference in the catalogue.

Subdivision of the "Subject Categories" is not recommended in general, but it may be anticipated that electrical and mechanical drawings, which require very little general subject cross-indexing, will become numerous enough to justify broad subdivisions for both filing and indexing. This is done by using parenthetical symbols, as shown in Table II.

Further specific title breakdowns within both the Subject Categories and the parenthetical subdivisions are accomplished by the use of alphabetical or special tabs in the catalogue file.

The third part of the index, the "Size Letter," is considered next in order to simplify the explanation of filing. The Size Letter, a single, small-case letter from Table I, indicates the size of the sheet and the corresponding sizes of the board and cabinet in which the sheet is filed. Thus a size *h* sheet will be filed on a size *h* board in a size *h* cabinet. Each board will carry only those sheets with a common "Controlling Symbol," as, for example, *G*. Geology maps of the organization, then, will be carried on the *G* boards of various sizes—*Gb, Gd, Gh,* etc.; in *G* notebooks—*Ga;* or in drawers or compartments—*Gp, Gm,* etc. It may be that an entire *h* cabinet will be assigned to *Gh* boards; but if space is limited, boards of other subjects, say *Ch* or *Th* boards, may be placed in the same cabinet.

The middle or second part of the index, the "Board and Sheet Number," consists of an integer and a decimal number. The integer shows the notebook, board, or compartment number in sequence within the size division of the "Subject Category" file. The decimal number shows the sequence of the map or drawing in the particular notebook, board, or compartment. The integer must be applied to the map or drawing as soon as the catalogue card is filled out. This will localize the sheet to a specific board or compartment. The decimal may be added later, or, in certain cases, as in block map arrangements, it need not be added at all. This scheme makes it possible to add related drawings to the same board or

compartment merely by adding another decimal to the integer.

Board numbers can be used for subdivisions by allocating certain numbers to specific subjects. Thus, boards numbered from 1 to 99 can be reserved for the home mine; from 100 to 199 for outside property X, etc. This method has been used at Bunker Hill to group maps within common geographical boundaries.

The final index, then, is the combination of the three parts just described. Perhaps the size letter should follow the category symbol directly, but the separation of the symbol from the letter by the board number obviates any confusion in reading the index.

As an example, let us suppose that a geologist drafts a map on a standard *h* size sheet of tracing cloth. The map shows geology, claims, and topography —information in three "Subject Categories," the last two of which are normally under the cognizance of the mining engineering department. Nevertheless, the map is made by the geologist for geological purposes and should be placed in the geological map file. The "Controlling Symbol" is, therefore, *G*. If the claim and topographic information is compiled, the map is of value as a claim map and as a topographic map; it should, therefore, be cross-indexed under both claims and topography. So the complete "Subject Category Symbol" will be "GCT." The map will be filed on an *h* size board, say on the second board in the geology file (the G2h Board) and as the fifth map on that board. The "Board and Sheet Number" will then be 2.5 and the complete index or drawing number will be "GCT 2.5 h." If the map is one of a series in which its final sequence is not yet certain, it can be given the partial index "GCT 2. h" and the decimal can be added later when the series is completed and finally arranged. It must be remembered that the *CT* symbols have no bearing on the filing; the sheet would be filed along with other sheets having the Controlling Symbol *G*, on the G2h board.

Underground geology maps, assay maps, and ventilation maps need not be cross-indexed in the workings *W* catalogue, for the base maps presumably are *W* maps already indexed in the *W* catalogue. For outside properties, however, the only map available may be one showing, say, geology, i.e., a *G* map; it should then be given the symbols *GW* and cross-indexed under *W*.

The Card Catalogue

Maps and drawings are best catalogued on good grade 3 by 5-in. cards, or on 7.5 by 12.5-cm. library cards, arranged in card catalogue drawers, preferably fitted with screw rods. Cards are grouped by "Subject Category"—one card drawer or one portion of a card drawer for each category—and in alphabetical title sequence within each category grouping. The primary card for each sheet is a white card, Fig. 4, which goes into the card drawer of the "Controlling Symbol" category. For each "Cross-Indexing Symbol" a buff-colored card is made out with entries identical with those on the white card, Fig. 4. The buff cards go into their respective category drawers along with white and other buff cards. Thus, for a *GCT* map, a white card is placed in the geology card catalogue drawer (*G*) and two buff cards are placed in alphabetical sequence in the claims drawer *C* and topography drawer *T*, respectively.

The card catalogue enables one to find a certain sheet quickly when the title or the approximate title is known. While the system as outlined groups the sheet under broad subjects, the catalogue should not be regarded as a primary information file on special groups of subjects. There is always the temptation to group, say, claim cards, into narrow geographical units, or into groups representing prospects under some particular metal; or under a particular ownership. Each such subdivision imposed on the card catalogue merely complicates the finding of the desired sheet. It is a good rule to file the primary cards within a category in alphabetical sequence of titles most likely to be permanent and best known. Thus, a map covering the Gold Bug Group of Claims of the ABC Mining Co. should be catalogued under Gold Bug rather than under the ABC Mining Co., for ownership of the claim group may change but the name of the group will not.

If, within the claim drawer, a cross reference to show ownership desired, a plain white card listing the owner and the claim groups owned can be inserted. Thus: ABC MINING COMPANY
See: Gold Bug Group of Claims
Keystone Group of Claims
Pine Tree Group of Claims

Cross references, which are always a problem, can be minimized by following the rule that the primary catalogue card will be filed alphabetically according to the first word of the main title shown in the title format on the sheet. A suitable format is shown in Fig. 5; the corresponding cards for this sheet are shown in Fig. 4. The main title, which must be chosen with filing in mind, is, in this case, "CONTACT MINE —200 LEVEL." The cards will be filed in their respective category drawers and positioned alphabetically under "CONTACT." If the cards are to be filed under an ownership or other grouping, the top line on the card is capitalized. Thus: U. S. FOREST SERVICE
Montana—Cabinet National Forest

If a mining company operates several mines, a plain white card can be used for cross reference. Thus: ABC MINING COMPANY
see: Mary Mine
Jane Mine
Alice Mine
Contact Mine

If a series of similar geological level sheets of a single mine are grouped on a single board, the common title can be shown on the primary catalogue card, thus: MARY MINE
GEOLOGICAL LEVEL MAPS
(see following card)

and the separate maps listed on a plain white card following. Thus:

MARY MINE—Geological Level Maps

Main Tunnel Level	G 103.1 h
100 Level	G 103.2 h
200 Level	G 103.3 h

In order to maintain control over entries to specific boards or compartments and to prevent duplications, the file clerk keeps a loose-leaf record of the sheets by individual board and compartment. The pages of this ledger are grouped by "Subject Category" and by size sequence within each category, just as the boards are arranged in the file itself.

A ledger page, Fig. 6, shows a list, in decimal sequence, of the sheets filed on a particular board or in a particular compartment. When a sheet is ready for filing, the "Board and Sheet Number" is assigned from this Ledger guide, which shows where space is available. When a board is full, the corresponding ledger sheet is marked "Filled."

Five Types of Variable Speed Drives

Type	Speed Range	Hp.	Belt	Sizes and Grooves	Typical Applications
Standard-range Stationary-control Vari-Pitch sheave (Adjust while drive is stationary)	Up to 28% speed increase	1 to 300	Standard A, B, C, D, or E Section	22 sizes; 2 to 12 grooves	Ventilating fans, circulation pumps, blowers, grinders, crushers, hammermills, agitators, conveyors, bucket elevators.
Standard-range Motion-control Vari-Pitch sheave (Adjustable while drive is in motion)	Up to 28% speed increase	1 to 300	Standard A, B, C, D, or E Section	21 sizes; 2 to 12 grooves	Solids handling, circulation and flood pumps, grinders, machine tools, fans, blowers, conveyors, slurry pumps.
Wide-range Stationary-control Vari-Pitch sheave (Adjust while drive is stationary)	Up to 100% speed increase	1 to 60	Wide Range Belts Q or R Section	6 sizes; 1 to 4 grooves	Circulation pumps, washers, conveyors, compressors.
Wide-range Automatic Vari-Pitch sheave (Adjustable while drive is in motion)	Up to 100% speed increase	1 to 60	Wide Range Belts Q or R Section	5 sizes; 2 to 4 grooves	Conveyors, solids handling pumps, flood pumps, ore feeders, generators, machine tools, agitators, sand mixers.
Vari-Pitch Speed changer (Adjustable while drive is in motion)	Up to 375% speed increase	1 to 75	Wide Range Belts Q, R, S, or T Sections	12 sizes; 1 to 5 grooves	Kilns, classifiers, pulverators, separators, conveyors, pumps, winding operations, crushers, slurry feeders, machine tools.

How the Variable-Speed Drive Can Boost Your Output

F. H. RUMBLE
Texrope Drive Department
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

THIS DRIVE CONTROLS RATE of ore fed at Cleveland-Cliffs' Hawkins mine, on Mesabi. It consists of motion-control Vari-Pitch sheave, companion sheave, four Texrope belts, and automatic motor base. It varies input speed from 20-hp., 865-rpm motor to Falk reducer from 700 to 865 rpm and uses remote-control push-button switch that can be operated from any position with speed control of feeder.

WHERE IMPROVED PERFORMANCE of plant equipment is sought, the variable-speed V-belt drive may be the answer. Use has long been made of the constant-speed multiple V-belt drive, and today this compact, short-center, shock-absorbing drive is found on crushers, screens, conveyors, washers, ventilating fans and mills, largely because it is low-cost, long-lived and easily installed. Many plant superintendents are now discovering that by use of variable-pitch multiple-groove sheaves they can continue to enjoy the benefits of the V-belt drive and, in addition, have the advantages of variable speed.

In many instances, variable speed is being incorporated by manufacturers of mining machinery into their equipment because of demand for it. For example, it is difficult to predetermine the correct speed for driving a kiln. For this reason many plant engineers insist that kilns be designed for variable-speed V-belt drive so that, if the speed is found to be incorrect when they are erected, it can be adjusted quickly and easily.

In some cases, ability to change the speed of a kiln according to the raw material processed is desirable.

Use of variable speed V-belt drives and speed changers which permit a wide range of speeds has been in evidence in recent years. They are much used on classifiers, pulverizers, kilns and conveyors, and have been adapted with success for slurry feeders and pumps.

Application Wide

In general, the variable-speed drive is practical wherever a constant speed V-belt drive can be applied. It can often be installed on existing machinery to make a higher production rate possible or to synchronize the speed of one piece of equipment with that of another and avoid periodic shutdowns. Careful study and experiment will often show the desirability of increasing the speed of a pump, conveyor, agitator or screen at times when conditions are favorable and decreasing it when they become unfavorable.

For instance, the operator of a de-watering screen which got its feed via a solids-handling pump, found that the screen would clog momentarily. The feed would soon pile up and the pump would have to be stopped until the screen was partially cleared. The pump was driven through a multiple V-belt drive from a standard speed motor. The problem was solved by installing a motion-control variable-pitch sheave on the motor. This permitted the pump speed to be synchronized with the screen speed and eliminated shutdowns. Many other cases might be cited.

Speed Change by Sheave Change

It is, of course, possible to change the speed ratio of sheaves; that is, use a smaller or larger constant-diameter sheave on the motor and so change the speed of the driven machine. As an experiment this is often desirable. The disadvantage of using several sheaves is that the sheaves have to be interchanged every time a speed change is wanted. If this is done even a few times per season, it may be well to use a variable-pitch sheave. Then the variation in speed can be effected simply by changing the sheave's pitch diameter without dismantling the drive.

A variety of types of variable-speed drives is available. The one best fitted to fill all the needs of the equipment unit at the lowest cost should be selected.

Only three principal questions need be answered, in analyzing the desirability and possibility of changing a constant speed V-belt drive to variable speed.

(1) What horsepower is involved?

(2) What speed range is required?

(3) Can the driven machine be stopped while in use? The answers will determine which of the available types of variable-speed drive is best.

For example, if a solids-handling pump application requires 100 hp., needs a speed range of 20%, and must be changed while the pump is in use, then a standard-range motion-control is the type of V-belt drive to use. If the same conditions prevail save that the pump can be stopped while the speed change is being made, the lower-priced standard-range stationary-control type of drive can be used. If there is doubt on these points, any reputable distributor of variable-pitch sheaves will be glad to assist in making the analysis and recommend the type of drive needed.

The accompanying chart lists five types of Texrope variable-speed drives with speed range, horsepower capacity, size, type and method of speed change of each classified with typical applications.

More Spodumene From Kings Mountain

CONSIDERABLE EXPANSION in mining and processing of spodumene at the Kings Mountain, N. C., deposits is being planned by Foote Mineral Co., Philadelphia, Pa. The deposits are said to be the largest in the United States and have taken on greater importance due to the present world situation.

At present the plant is working 24 hours a day, seven days a week, and producing 350 to 400 tons daily. It is planned to increase the capacity of the plant to 600 tons a day. Additional equipment will be installed. The mill now has two 200-ton pebble mills in operation. A new rod mill and other facilities are to be provided.

The additional production will be shipped to the company's lithium plant at Paoli, Pa. It is proposed to construct a new lithium plant at Gate City in southwest Virginia, which is near good limestone deposits.

The expansion at Kings Mountain calls for further exploration work and mapping of deposits. So far, the company has more than 5,000 ft. of core drill holes and will drill others. Ore reserves are ample, in places extending 900 ft. or more in depth. The entire deposit covers a belt about 30 mi. long and from ½ to 2 mi. wide, extending into South Carolina.

At present the deposit yields spodumene, feldspar, mica, silica, tin, siderite and columbite. All of these are now being recovered with the exception of feldspar; it is planned to recover that at a later date.

Westmoreland Manganese by 1953

WESTMORELAND MANGANESE CORP. of Batesville, Ark. has signed an agreement with DMPA which provides for annual production of 52,800 long tons of processed ore (concentrates) starting about Jan., 1953, and reaching full production about April, 1953. The company's capacity production will amount to roughly 3% of total U.S. consumption in 1951.

DMPA will advance $3,807,250 at 4% interest; it will be paid back in the form of ore or concentrate delivered to the government. DMPA will pay $1.67 or $1.72 per unit of manganese during the first four months. The price drops to $1.37 or $1.42 during the next six months. From then on, it is subject to readjustment based on production costs. The contract ends with 264,000 tons, six years of production, or June 30, 1959—whichever is first.

The company in turn will build a 6,000-ton-per-day washing plant near Cushman, and will make up to 10% of its capacity available to independent local operators. Moneys will go for the plant, working capital, and completion of land purchases.

The company's ore is in deposits over a wide area near Cushman. They are low in grade, and consist of wad and carbonate—often with a fairly high iron content. The ore is mixed with clay, and will be mined by shovel. The washing plant will produce lump ore and a concentrate assaying about 46% manganese.

Why Gold Premium Markets

Will foreign sales of gold kill the higher prices paid in the world's free markets? Mr. Bratter, a frequent contributor to *E&MJ*, thinks not. The drive to hoard gold is too strong.

HERBERT BRATTER,
Washington, D.C.

THE UNITED STATES GOVERNMENT, as a member of the International Monetary Fund, agreed on Sept. 28, 1951 with the Fund's decision to let member countries sell gold as they wished, "for industrial and artistic purposes," on the world's free markets.

There's nothing more artistic after all, or more symbolic of industry, than a neat bundle of gold bars buried under the concrete floor of one's garage.

Of course, the U.S. Government's acquiescence in the Fund's move didn't mean that U.S. miners could cash in on the world's artistic urge to collect gold, too. The status of U.S. gold miners is still, unhappily, quo. In fact, there's some reason to believe that our government hoped the ensuing flood of gold would melt the premium markets right down to the $35 level. That would silence the gold miners' demands for a higher price at least.

Perhaps that could have happened if a flood of gold had entered the markets. But it didn't. Miners have been cautious. True, the premium price declined by $1.50 to $2 after the announcement, but since October it has been relatively steady. Just before the September announcement the international price of gold on premium markets was $40.50. On Jan. 9, 1952, it was $39. The difference between this and the "official" price of $35 is not all profit, for Fund members which permit sales on the premium markets usually adhere to the fiction that the gold exported must be sold to "industry" customers and therefore be in semi-fabricated form.

Because some of the newcomers on the premium markets show signs of not knowing how to participate in it to best advantage, the full impact of additional offerings of newly mined gold may not yet have made itself felt on the premium price. Miners who have wanted to reach for two birds in the premium-market bush may yet end up with little more than the $35 bird in hand.

To get a premium price for gold the seller must find a particular buyer. This in itself is not easy if one has not established connections abroad. Since premium prices in the numerous gold-trading centers are never exactly the same, to sell gold to the best advantage requires having connections in many trading centers and having one's finger on the market pulses wherever they may be. One needs as well an expert knowledge of the foreign-exchange markets. For this reason the long-established world metal traders and exchange-and-bullion arbitrators have a great advantage over the average gold-mining company.

South Africa, already selling about 40% of its new production on premium markets, is anxious not to kill the goose that lays the premium eggs. It has been regulating its own sales to prevent the premium price from declining below about $38.50. With other gold producers crowding through the door South Africa opened, the premium will be harder to control.

Canada and Australia, also Southern Rhodesia and other gold-producing colonies have since announced that they are permitting newly mined gold to be sold on the premium markets. Canada permits gold mines to elect in advance either of two courses: to sell abroad at whatever price may be gotten or sell to the Canadian Government at the official price plus a subsidy payment. Australia permits the greater part of its gold output to be sold on the world's premium markets, but continues to press for a higher official price. The Crown Colonies, due to pressure from South Africa on the UK Government, are allowing their mines to sell on the premium market only about 40% of the output, as South Africa has done.

The Fund's September decision has given rise to quite varied reactions abroad, as reflected in the press. From London, where large investments in world gold mining are held, have issued some caustic, and perhaps wishful, comments on the future effects. *The Banker* cites toleration of internal gold markets as the first breach in the IMF's gold policy; the second is permitting private sale of gold against "industrial" affidavits. It was to prevent dissolution of the Fund, it says, that the IMF amended its gold rules. The article continues:

"If there is one prophecy that can be made with a fair degree of confidence, it is that very little gold will in fact be sold at $35 per oz. . . . So far as the United Kingdom is concerned, . . . if the producers make their premium sales in exchange for U.S. dollars, as is normally done, the reserves of the sterling area need not suffer . . . A somewhat delicate situation may arise, however, if the United States dollars secured by premium sales of gold are converted by the Exchange Equalization Account into gold in New York . . . at $35 an ounce. Already, the United States authorities have shown some diffidence in extending this facility for gold conversion to dollars earned by South Africa.

"The position . . . is thoroughly unsatisfactory, and is clearly untenable for any length of time . . . It is difficult to believe that the coexistence of two different prices for gold can endure for long."

The Statist (London) carried a Swiss reaction to the Fund's new policy. It points out that, as gold-mining costs rise, the proportion of newly mined metal going to the premium markets must increase and adds:

"Most likely the removal of the veto on trading in industrial gold will lead many countries to lift the restrictions on the possession of gold by private persons."

The article states that gold hoarders are betting on either of two results:

(1) that the scarcity of new gold for monetary reserves will make it even more difficult for governments to hold the official price at $35, or

Aren't Likely To Disappear

(2) if more newly mined gold is reserved for sale to governments at $35, the scarcity of gold on the premium markets will drive up the premium.

Loosen Controls

The Swiss, with more gold per capita than any other people, are very sensitive to actions of the International Monetary Fund, or its individual members, affecting gold. Although Switzerland is not a member of the IMF, its gold policy has been in keeping with IMF developments. Thus, at a time when the IMF officially frowned upon international gold transactions at premium prices, Switzerland in 1947 suspended the sale of gold coins to the public and of gold bars to commercial banks. Whatever the aims of the suspensions—which were sharply criticized in Switzerland—the result was to keep Swiss gold out of the premium markets. On the other hand, since December, 1950, Switzerland has countenanced a lively transit trade in "industrial gold" which plays a large role in the world premium markets.

The 1947 measures rest on a law which expires at the end of 1952, when new policies must be formulated unless the Swiss gold market is again to become completely free. With this fact in mind and with an eye to the IMF's September, 1951 gold decision Switzerland in December allowed an internal free gold market to come into being, with trading at premium prices. Regulations requiring permits for importation and exportation of gold remain in force in the case of monetary gold, but not for gold in other forms. Since the National Bank is not selling gold to the public at any price, the Swiss free market depends for its supply on gold which was previously hoarded in Switzerland or on imported "industrial" or semi-fabricated gold.

Producers Get Help

Some of the gold producers have not had sufficient knowledge of the premium markets to take full advantage of the opportunity the IMF has given them. To meet this need, Samuel Montagu and Sons, well-known London bullion dealers and brokers, have acquired control of Goldsmith Brothers, one of the largest Canadian refiners. Soon after the Fund announcement, it was reported from Southern Rhodesia that a London firm was planning to establish a subsidiary in Bulawayo to process some of the colony's premium gold. For marketing the gold, the South African Treasury has agreed to permit Southern Rhodesia to use the channels and marketing machinery already used by South African gold miners.

U.S. Feeds Markets?

When Canada gave its gold mines the option of selling their output on the premium markets, some persons pointed out that the US, in continuing to license exports of semi-processed gold to Canada, was in effect feeding the world premium markets. The reasoning was that Canadian gold was bringing a premium abroad while Canadian industry was getting $35 gold from the USA. In fact, this is true. But the volume of the business is small.

Semi-processed American gold is being shipped to Canada by American firms just as it has been for years. Washington authorities reason that to stop the trade just because Canadian mines may export to the premium markets, would be to interfere with a regular American export trade. They point out that the US is licensing the export of semi-processed gold to a large list of foreign destinations, many of which are also gold-producing countries; and that the US does this in recognition of a long-established export trade. Moreover, the US does everything possible to make sure that gold exports so licensed are used for industrial purposes.

Gold in Transit

Larger than the volume of semi-fabricated and fabricated gold is the traffic of transit gold: that is, gold contained in foreign-owned gold-bearing materials sent to the USA for refining. From such materials 273,000 oz. of gold were extracted in the USA during 1951 and re-exported.

The principal countries of origin of this gold were:

Nicaragua	101,000 oz.
Chile	70,000
Philippines	35,000
Honduras	32,000
Portugal	15,000

The chief destinations of this gold were:

Kuwait	186,000 oz.
Philippines	35,000
Portugal	17,000
Uruguay	9,000
Morocco (Tangier)	2,000

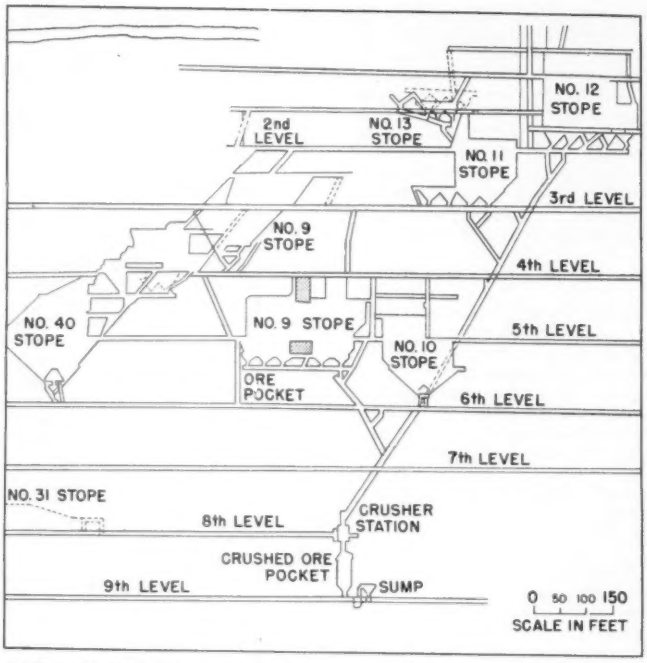
Price Outlook

No major changes in the official price of gold are in sight. Individual countries may from time to time adjust their official price by currency devaluation or revaluation, although no repetition of the wave of devaluations that occurred in 1949 is likely so long as the British pound remains unaltered. The principal benchmark of the world gold business is the US official price, still holding firm at $35 an ounce. That this price will be increased, as hoarders think or hope, because of a much higher price on free markets or inadequacy of the American monetary reserves, is not a predictable event. The present administration seems firmly wedded to the $35 price and there is no reason to suppose that a Republican administration would want to change the price. A repetition of the circumstances which were the occasion for the 1933 devaluation of the dollar is not the horizon, although some see an end to the existing boom.

The premium, which hoarders for years have been willing to pay for gold, arises from lack of confidence in managed monetary units, not excluding the US dollar, and from fear of domestic and international political and military developments. The world has suffered from war psychosis so long and national budgets have been so long unbalanced, it would take an extended period of peace and security to reduce the gold hoarding demand to more normal proportions.

Thus, the prospect is for continuance of a premium price in free markets and black markets. Should the premium tend to increase, South Africa and other producing countries may be expected to increase the volume of their offerings, just as with a declining premium South Africa, for one, has tended to reduce its offerings. This suggests a fairly narrow band of fluctuation for the premium, until some new major development occurs. .

KEEPING TAB ON PRACTICE



ORE PASS SYSTEM, delivering to jaw crusher on 8th level (1000-ft. elevation) of Canadian Malartic gold mine, utilizes long gravity drop to help reduce large fragments.

Crushing Underground Aided by Gravity Drop Improves Breaking and Haulage Costs

ADOPTION OF CRUSHING UNDERGROUND on its 1000-ft. horizon and utilization of the fall of the ore in a long ore pass feeding the crusher to break large fragments has enabled Canadian Malartic Gold Mines, in Quebec, to reduce its secondary breaking and haulage costs materially and win other advantages.

A jaw crusher was installed on the 8th level, at the horizon mentioned, under Nos. 9, 10, 11 and 12 orebodies, as shown on the accompanying elevation. Inasmuch as these stopes feed by gravity directly into the ore-pass system a maximum opening of 40 in. between the grizzly bars was adopted. Before the crusher was installed, the grizzly openings in all stopes had been 14 or 16 in., the surface crushing plant being unable to handle anything larger than minus 14-in. material.

Secondary breaking costs have been reduced from the 1947-50 average of $0.622 to $0.491 per ton milled. This is all the more noteworthy when the increase in costs of labor and explosives is considered.

Haulage costs also have been lowered materially, hoisting efficiency raised, capacity for storing broken muck underground increased, and surface crushing improved. No original techniques are said to have been used in the general layout.

As shown in the drawing, the ore-pass system was developed from the 8th level up to the 2d level, tapping Nos. 9, 10, 11 and 12 stopes directly and providing openings on the 6th, 5th, 4th, and 3rd levels for ore trammed from the various additional stopes that were being worked. The stopes delivering to these four levels have 30-in. grizzly openings.

The ore-pass system was open throughout, without intermediate control gates. The raises making the pass had been driven at 55 deg. to the horizontal to obtain maximum fragmentation for the falling ore. They were 6x8 ft. in cross section, except between the 8th and 6th levels where they had been slashed from 5x8 ft. to give an 11x11-ft. cross section, in order to provide storage for 2,000 tons above the crusher. This would permit the grizzly scram drifts to be operated continuously.

The jaw crusher was 36x48 in. in size and set to 5 in. The floor for operating it was placed at the drift-floor elevation for economical operation and maintenance. A disadvantage of the layout is that it does not provide for handling any ore mined on the 8th level.

Ore is fed from the pass by a 33-deg. gravity steel chute which is controlled by an air-operated 2½-in. chain cramp gate. Fines bypass the crusher via a grizzly with bars spaced 4 in. apart ahead of the crusher. A 10-ton hand-operated crawl covers the crusher station. Crusher product falls into a 1,200-ton pocket cut out below the station.

The existing 9th level haulage drift was extended to handle the crushed ore. It was driven 8x8 ft. at 0.5% grade in favor of the load. The existing 88-cu. ft. Granby-type cars and 3-ton Goodman locomotive are used for the 1,500-ft. haul to the main loading pocket at No. 2 shaft.

The track was reconditioned and all curves lengthened to avoid exceeding 100 ft. minimum radius.

A sump was cut out under the loading chute to take care of the excessive slimes produced by breaking ore in the open stopes and extensive ore-pass system.

The chute is of the standard size except that the width is 7 ft., 4 in. inside. This increased width did away with double-spotting of the cars which was difficult to enforce. The chutes previously used had been only 3 ft., 6 in. and 4 ft. wide, and the cars, 8 ft., 11 in. in length, could be filled only partially with one spotting. The car factor (tonnage hauled divided by number of cars trammed) was increased by nearly 50%. Inside length of the 88-cu. ft. capacity car is 8 ft., 11 in.

Faster loading is possible with this chute. The wide throat allows muck to run freely, so that it does not hang up and cause delays.

The undercut arc gate is operated by two end-mounted 8-in. air cylinders above the gate. Two worn-out 24x36-in. crusher plates, operated by an 8-in. air cylinder, were hung above the gate as buffer plates. This has decreased the stress and shock on the gate to a minimum. The chute is lined with standard steel plate: 1-in. plate for the floor and ½-in. for the sides.

Further Work Justifies Diesel Haulage Installed in Zinc Mine at Jefferson City, Tenn.

WITH TWO DIESEL LOCOMOTIVES in service in its Jefferson City zinc mine and a third on order (late in 1951), U. S. Steel's Universal Exploration Co. feels it knows enough about their performance underground when equipped with a conditioner, to justify its use of them. Frank B. Brophy, assistant general superintendent, had the following to say about their experience when talking before the American Industrial Hygiene Association in Nashville, Tenn., recently:

"We are convinced that a diesel locomotive can be operated with safety in the underground operations. After observing many types of diesel-powered equipment, operating under various conditions and in a variety of tests with and without scrubbers, we believe that a properly designed scrubber is definitely a necessary addition to an engine, that some means be employed to neutralize the acid water in the bath, that uniform and positive ventilation be provided, and that quiescent spots be removed by forced ventilation. We believe now that the volume of irritating gases being discharged into the mine atmosphere will remain nearly constant and be harmless if the engine and conditioner are properly serviced, a clean grade of fuel oil is used, and enough ventilation is supplied."

The locomotive used is a small articulated-type that fits well into the haulage system and has performed satisfactorily. It is 48 in. high, 39 in. wide and 14 ft. long, and is powered by a two-cylinder, four-cycle, indirect-injection diesel engine that develops 20 hp. at 1,200 rpm and 30 hp. at 1,800 rpm. The manifold is water-cooled and the exhaust gas is treated in a stainless-steel conditioner.

Visits to various U. S. mines using diesel-powered equipment satisfied the company as to the safety of men underground if the ventilation was sufficient. The volume of air passing through the Jefferson City workings in which the engines operate ranges from 7,000 to 39,000 cfm, much more than safe operation calls for. The Bureau of Mines thinks that 75 cfm per bhp at maximum load and speed is enough when the engine works in virtually normal mine air.

Performance of the 20-hp. locomotives equipped with 23-gal. scrubbers is excellent. The volume of water used in a conditioner, however, in relation to the horsepower is no criterion for judging the efficiency unless the efficacy of the gas-liquid contact is known. The conditioner must be designed to create turbulence in a circulating liquid of high velocity and the gases then introduced. In this manner the maximum gas-liquid contact is obtained with a minimum volume of water in the conditioner.

Limerock is of great assistance. The gas-water mixture passes through the interstices between the rocks where surface tension makes the water adhere to them, thus releasing entrained gases and retaining the water in the conditioner. The limerock also performs a chemical function by neutralizing the acid gases dissolved in the water.

When diesel trucks are equipped with exhaust-gas conditioners, the scrubber water must be kept from being sucked into the engine if the truck stalls on a grade and starts going backward without a proper gear change. As a rule the engine is severely damaged. A check valve placed at a point where the exhaust pipe enters the scrubber is often used. This lets air pass ahead of the water into the engine, breaks the vacuum and leaves the water in a quiescent state. If an engine or truck is equipped with a fluid coupling or torque converter this situation will not develop.

Attention to Diesel Fuel Oil

Care in selecting diesel fuel oil is important, Mr. Brophy finds. Fuels acceptable for diesel equipment operating on the surface are not necessarily suitable for underground use. Furthermore, diesel fuel consisting of a mixture of fuel oils often results in a decided increase in tarry residue that affects the engine adversely and increases the work of the conditioner.

The engine manufacturer recommends a fuel oil having a "gum" content not exceeding 75 mg. per liter. Some fuels, upon purchase, will not exceed that amount, but within two weeks the gum will increase to 600 mg. This is caused evidently by polymerization.

Fuels approximating kerosene have been found to give good service. Where flash point is of no concern, an oil, with a flash point of 120, viscosity 31-32, SSU at 100 deg. F., sulphur content .05%, is well suited for underground use. Tests with such a fuel oil by an engine manufacturer to determine its suitability without a lubricant in the injection equipment were very satisfactory.

Tests made with a fuel oil of 150 flash point, viscosity 36-40, SSU at 100 deg. F., and 0.5% sulphur content, showed little difference in the final scrubber exhaust analyses, although the exhaust gas seemed more acrid. However, scrubber-water analysis showed that a higher percentage of sulphur and nitrogen oxides had been captured in the bath.

The engine manufacturer warns against storing fuels in rusty containers. This causes gumming quickly.

Simple Means Prove Sufficient for Grouting Ground Ahead of Shaft Sinking

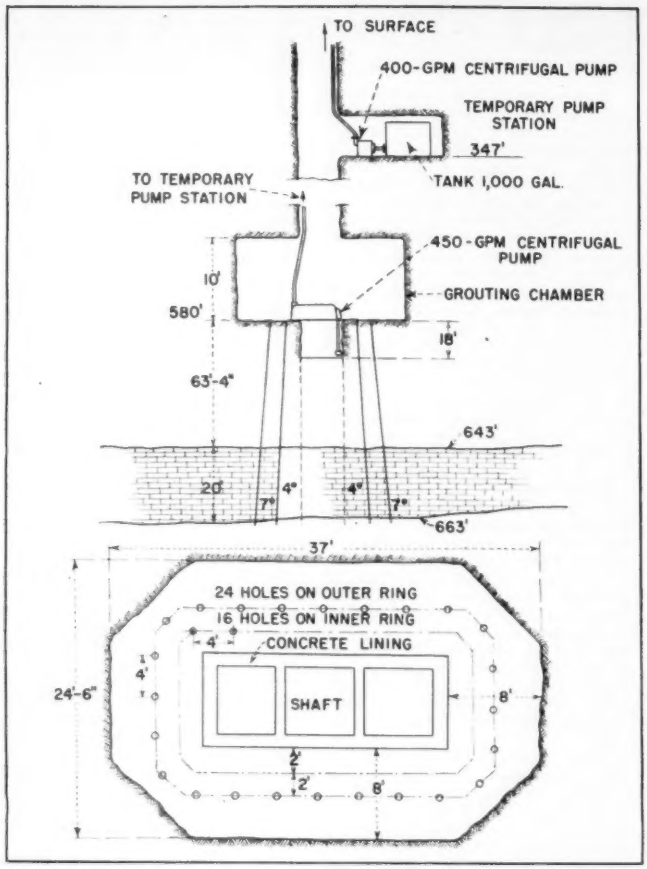
SHAFT SINKING in the Carlsbad potash area in New Mexico is at times troublesome and costly because of difficult ground conditions above the ore zone. To reach the sylvite, lying about 900 ft. below surface, the shaft must pass through 400 to 800 ft. of overburden consisting of layers of unconsolidated clay, shale, caliche, sand, limestone, and gypsum resting upon the salt formation which contains the various potash seams. Although a water-bearing formation, the Culebra, was found in the property of Duval Sulphur & Potash Co. at a depth of 640 ft., the two principal water horizons are at depths of 200 and 300 ft. In some localities "perched water" occurs in clay or sand, resulting in quicksand, at between 120 and 150 ft. Experience has shown that shafts ordinarily can be sunk through the deeper water-bearing formations by pressure grouting, but that the quicksands can only be conquered by freezing the shaft zone before sinking.

Among the examples of successful pressure grouting ahead of sinking are the operations completed recently in the two large vertical shafts of Duval Sulphur & Potash Co., one of the district's new producers. Duval's shafts are rectangular three-compartment shafts measuring 6x18 ft. inside the lining and 300 ft. apart. The sites were determined by previous test drilling and the shafts were sunk under contract by Utah Construction Co. The Culebra formation occurs in No. 1 at 640 ft. and No. 2 at 643 ft. Plant layout and drill pattern used in each shaft are shown on page 100.

All grouting was done from chambers 24½ ft. wide, 37 ft. long, and 10 ft. high established in the shafts at 580 ft. These were 18 ft. above the point at which sinking was stopped. Water made was pumped in two stages to the surface by a 450-gpm centrifugal pump installed in each grouting chamber and a 400-gpm centrifugal pump in each temporary pump station situated at 347 ft. Grouting equipment at each shaft consisted of a 10x5x10-in. steam pump, a 10-sack batch mixer, and a 2-in. grout line leading to the grouting stations. Connection between the grout line proper and hole to be grouted was made with a short section of 2-in. pipe fitted with a swivel joint and quick-action connector.

Holes in Two Rings

The drill pattern used called for drilling two rings of holes around the shaft—an inner ring of 16 holes, spaced 4 ft. and 2 ft. away from the



FOR GROUTING the ground when passing through the Culebra formation in sinking Duval Sulphur & Potash Co.'s Nos. 1 and 2 shafts, an inner ring of 16 AX diamond-drill holes and an outer ring of 24 holes were used. Drilling was done through special collar sleeves made from standard 2-in. pipe.

periphery of the lining, and an outer ring of 24 holes, spaced 4 ft. apart and collared 2 ft. away from the inner ring. All inner-ring holes were drilled 4 deg. outward from the shaft, and those of the outer ring 7 deg. Hole preparation on the inner ring consisted of advancing each hole 3 in. in diameter to a predetermined depth (20 ft.) and then placing and cementing 2-in. casing, followed by drilling through the water zone with a 1½-in. bit. The outer ring holes were first advanced 3¾ in. in diameter, 3-in. casing was placed and cemented, then drilled with a 2⅞-in. bit to the top of the water zone, and with a 1⅞-in. bit through the water zone. All holes were carefully washed with water to remove drill cuttings preparatory to pumping in cement slurry. This was followed by pumping water at high pressure into the holes to test the porosity of the formation. To improve penetration it was decided to acidize the holes. This was done by injecting two barrels of 15% hydrochloric acid into each hole at 700 psi pressure.

Following the acid treatment, the holes were again washed out and a grouting mix composed of 1 part cement and 1 part water was introduced at pressures up to 1,100 psi. After the grout had settled, the holes were drilled out and a second flow of grout pumped in. The outer-ring holes were grouted similarly except that oil-well cementing equipment capable of pressures up to 4,000 psi and with a mixing capacity of several hundred sacks of cement per hour, was used for pumping the slurry into the holes. Pressures from 1,400 to 1,600 psi were used at the grouting chambers, and 2,000 psi for closing in the holes. The 13-lb. grout normally used was composed of a mixture of cement, 97%, and bentonite, 3%. About 10,000 sacks of cement were pumped into the water-bearing formation in each shaft by alternate redrilling and grouting. Water seepage in the grouted formation subsequently sunk through amounted to about 3 gpm.

Radio Proves Its Value At Gogebic Range Iron Mine

A SYSTEM OF TWO-WAY RADIO communication has been installed on three locomotives on the 30th level of the Newport mine at Ironwood, Mich. These haulage units move most of the ore produced. This was done primarily to improve tramming, the layout requiring that the trains be loaded on a common track, a circumstance that often causes delays. With two-way communication between the operators of the trains, it is possible to prevent or minimize such delays.

Various other time-saving uses have been found for this two-way communication. When the block-signal lights failed due to a broken wire, the radio was resorted to as the sole means for directing the traffic to and from the shaft. When a breakdown of timber occurred in the far west end, the foreman, who was on the extreme east end, was notified. When a fire was started by an electrical high-resistance short, the operator of the m-g set in the pump room two levels above was told, via a locomotive at the shaft, to pull the feeder switch. When material or tools are required quickly, a call to a locomotive at the shaft is all that is necessary.

A secondary installation of two permanent stations has been added on the upper level, one at each end of the mine. It has been useful to the foremen in directing the tramming crews and advising them of a change in grade of ore. This saves a 250-ft. climb to the level below, which often had been necessary.

A set of soundphones is also to be installed in each mining pillar for better understanding between miners and chutemen or transfer men on the level. Verbal communication will now replace the multiple-light flashing signals, which have been used and frequently misinterpreted. Pickands, Mather & Co. operate the Newport for Youngstown Mines Corp. W. A. Knoll is general superintendent. H. L. Schieber is superintendent for Youngstown Mines at the Newport.

Detonating Fuse Finds Varied Use Underground

THE FOLLOWING LIST of uses for Primacord detonating fuse underground will supplement the data given in *E&MJ*, Feb., 1952, on pages 119-120. The six applications were reported by field representatives of Hercules Powder Co.:

1. For long-hole blasting—It is often used in long diamond drill or percussive drill holes to insure complete

(Continued on page 173)

 (Continued from page 69)

Crude Copper Output Shows Little Change

Production of crude copper in this country and abroad by companies reporting to Copper Institute showed little change in the first quarter, compared with the same quarter last year. A summary of the latest statistics, in tons, follows:

UNITED STATES

Production:	Feb.	March	Jan.-March 1951	Jan.-March 1952
Crude, primary	77,620	83,212	245,228	240,609
Crude, secondary	3,256	3,629	14,574	10,300
	80,876	86,841	259,802	250,909
Refined copper	95,979	94,563	324,131	290,811
Deliveries, refined	(a)104,795	(a)112,625	324,406	(a)347,850
Stocks at end, refined	(b)59,747	(b)58,487	55,609	(b)58,487

OUTSIDE UNITED STATES

Production:	Feb.	March	Jan.-March 1951	Jan.-March 1952
Crude, primary	109,395	118,348	341,510	338,263
Crude, secondary	1,181	496	848	2,050
	110,576	118,844	342,358	340,313
Refined copper	95,264	98,767	288,690	292,946
Deliveries, refined	84,061	77,427	223,351	246,961
Stocks at end, refined	154,771	163,220	161,472	163,220

(a) Includes tonnages delivered from government stocks (b) Includes tonnages delivered to U. S. consumers at foreign ports.

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Metals. Delivered prices in effect as April ended were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	231	0	0
Fire refined, high conductivity	231	0	0
Fire refined, high grade	230	10	0
Fire refined, min. 99.7 percent	230	0	0
Fire refined, min. 99.2 percent	229	10	0
LEAD:			
Soft, foreign duty paid	163	0	0
Soft, Empire	163	0	0
English, refined	164	10	0
ZINC:			
Foreign (G.o.b.) duty paid	190	0	0
Domestic (G.o.b.) duty paid	190	0	0
Prime Western and debased	190	0	0
Refined and electrolytic	194	0	0
Minimum 99.99 percent	196	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

April 30, 1952

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	47.35c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.55
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$2.40
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$202 @ $205
Selenium, 99.5 percent, lb.	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Berryllium Ore, imported, 10% BeO, per unit	$36.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $28.00
48% Cr_2O_3, 3 to 1 ratio	$44.00 @ $55.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$245.95
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.20 @ $1.24, c.i.f. U. S. ports, duty extra. Long-term contract nominal at 90c. to 95c., c.i.f., duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.00 @ $2.25
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, U. S. equivalent, duty extra	$57.50 @ $60.00
Domestic, scheelite, 60 percent f.o.b. mill	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$135.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	6½c.
Cobalt Oxide, 72½ to 73½%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$8.95 @ $9.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21½c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$183.00
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$5.00
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$75.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.00
Refuse or shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$43.00
60% effective CaF2	$40.00
Acid 97% concentrate, bulk, ton	$60.00 @ $65.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

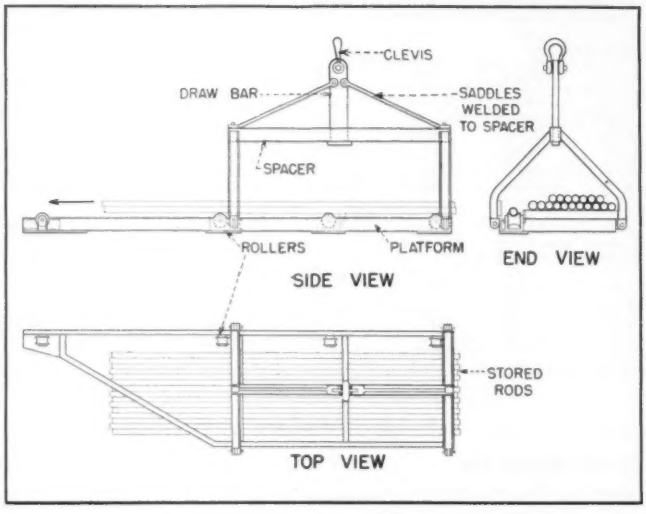
(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structural shapes, 100 lb.	$3.65

OPERATING IDEAS

Rack Is Faster, Safer Way of Charging Rods



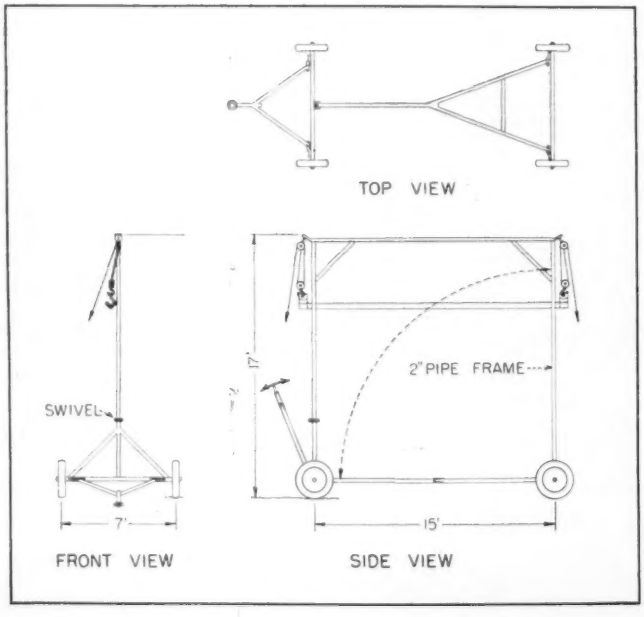
THE SPECIAL RACK at the left is Bradley Mining Co.'s answer to the problem of charging 4-in. rods to its 4x10-ft. mill at Yellow Pine.

Points of design: The platform on which rods rest is made of channel iron, and on one side has a train of four rollers. Bolted to the platform is a suspension system consisting of two saddles, spacer, two tie rods, and a draw bar which attaches to a clevis.

Rod charging works like this: Using an overhead crane, an operator places rods on the platform. Then he picks up the rack with the crane, and moves the rack into position in front of the mill. Finally, workmen roll rods onto the rollers and run them into the mill.

Advantages are speed—a great reduction in down-time of the mill; and safety—virtually no chance for smashed toes and much smaller chance for smashed fingers.

Portable Arch for Trail Cables



USBM DEVELOPED this portable arch for shovel and compressor cables at Rifle, Colo.

The frame is of 2-in. pipe.

Axles, wheels, and tires are from 16-in.-diameter automobile assembly.

The trough which actually holds the cable is suspended from pulleys so that workmen, without power assistance, can easily lower and raise it.

In position, the tongue is folded upward, and the lower-frame "Y" is folded upward to allow traffic through the arch.

This information is from Bureau of Mines Report of Investigations, 4810.

If you have to paint behind pipes, or radiator tubes of an electrical transformer (like Westinghouse Electric Corp. does), and you can't get a brush behind them, here's a way to save time, paint, and get complete coverage.

Cut a strip of rubber from an old inner tube, dip it in the paint, apply with a shoe-shine motion.

Some Things Are WORSE THAN STRIKES

This editorial which appears in McGraw-Hill publications was written just prior to the resignation of Charles E. Wilson as Director of Mobilization. The principle it discusses is of basic and continuing importance in our struggle to maintain economic and personal freedom in America.

It is to be hoped that the managements of the steel industry will resolutely resist the efforts of the national Wage Stabilization Board to force them to establish the union shop in their plants. In essence, the union shop means compulsory union membership.

They should resist not because of any financial advantage to the owners of the industry. There would be none. They should resist out of a decent regard for those ideals of our country which we are now fighting in Korea to protect. Moreover, their resistance would, as a matter of fact, benefit the leaders of the organized steel workers by protecting them from the certain and bitter fruits of their "victory" in getting the government to impose the union shop on the steel industry. Their successful resistance would also prevent Premier Stalin and his co-workers from enjoying a hearty laugh at our expense.

Fun for the Russians

This is why the Politburo would find the establishment of the union shop in the steel industry, at the behest of the Wage Stabilization Board, so profoundly amusing. We are fighting in Korea because we believe that armed aggression, promoted by Russia, menaces our freedom. And we are spending hundreds of billions of dollars here at home for armament to protect our freedom at other danger points. When this rearmament program is threatened by a crippling strike, the federal government through its Wage Stabilization Board proposes to buy off the threat by plowing under a vital element of that freedom which we are trying so desperately to preserve.

When the union shop is adopted through voluntary agreement, as it has been in cases covering millions of workers, it deeply undercuts the freedom of the individual. To hold his job he is required to join the union and support it financially whether he wants to or not. In the case of such voluntary agreement, however, the government takes no direct part in thus destroying the freedom of its citizens. It is essentially a private transaction.

Tyranny is the Word

But in the steel case the federal government becomes a party to a direct attempt to impose the union shop. Instead of protecting its citizens in their right to earn a livelihood, the government forces certain of them to join and support a private organization which they have clearly indicated they do not want to join. This they must do to hold their jobs. Tyranny is the accepted designation of government coercion of this kind.

It may be objected that the Wage Stabilization Board merely recommends the union shop, does not order it. This was also true of the action recently taken by a President's Emergency Board, which also "recommended" that working agreements between the

railroads and about a million non-operating railroad employees include a provision for the union shop. A government recommendation, however, can easily be given much of the force of an order, particularly by the calling of a strike to "uphold the hand of the government."

It seems entirely clear that in trying to impose the union shop on the steel industry the Wage Stabilization Board has completely lost its bearings. It was set up to handle labor problems to tide over an emergency. Now it comes up with a revolutionary modification of labor relations in the steel industry which, if adopted, would become a permanent part of the institutional machinery of the industry.

"Too Much Like Hitler"

Early in World War II an effort was made to have the federal government order the union shop for a group of organized coal miners. President Franklin D. Roosevelt, who will go down in history as one of organized labor's greatest champions, blocked it. "That," he said, "would be too much like the Hitler methods toward labor." But now, with supreme irony, the federal government fosters this Hitlerlike method toward labor ostensibly to advance our conflict with Stalin.

In persuading the Wage Stabilization Board to sponsor the union shop for steel workers, there is every reason to believe that the union leaders have trapped themselves. If the government imposes the union shop, a next step clearly becomes necessary. This is government regulation of the union in order to provide a modicum of protection for the minority that would be forced by the government to join against their will. It could be that for a time the government would ignore this obligation. But, having granted the union the power to eliminate the minority, it would sooner or later be forced to regulate the use of that power. Thus free collective bargaining and freedom itself would be the losers.

An Issue of Basic Principle

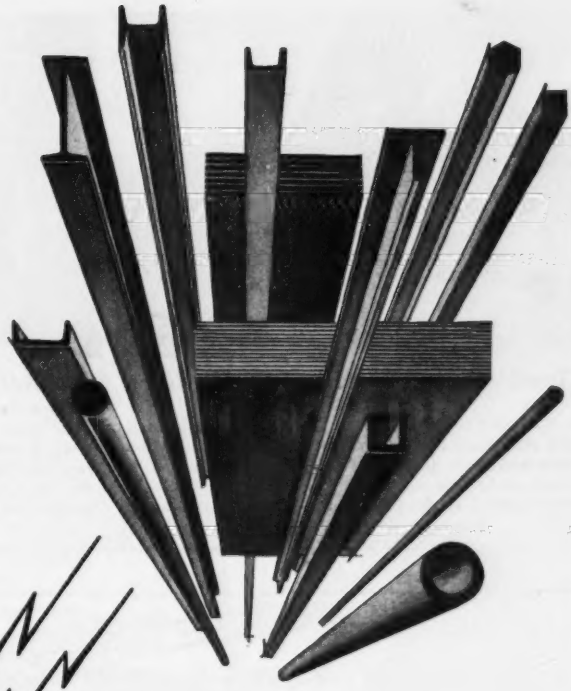
Resistance to a government-sponsored union shop for the steel industry is bound to bring harsh denunciation both from the administration and union leaders who have teamed to back it. Not only does the union shop relieve the union leaders of the problem of recruiting members, it also eliminates a group of workers that they stigmatize as "free riders"—namely, those who work for companies which have a working agreement with a union but do not join the union. In the basic steel industry about 10 per cent of those who work for companies with union agreements are not members of the union. Such a small percentage of non-members is obviously no threat to the "security" of the union, although that is what the drive for the union shop ostensibly is designed to protect.

In the reporting of the present labor dispute in the steel industry virtually all of the attention has been focussed on the handling of the issue of a wage increase and how large it should be. This, to be sure, is vitally important. Mobilization Director Wilson has said it is "a serious threat to our year-old effort to stabilize the economy." But certainly of comparable importance is the tremendous issue of principle raised by the government's backing of the union shop for the steel industry.

If the position of the Wage Stabilization Board on the union shop prevails, our government will have blunted the arms we are forging to fight for our freedom abroad by undermining a major bulwark of our freedom right here at home. At this critical time in the struggle to preserve and protect our freedom such a subversive course should be resisted to the limit.

McGraw-Hill Publishing Company, Inc.

STEEL
for the MINING INDUSTRY



In stock...Prompt shipment

When you call Ryerson for steel, you can be sure of prompt, personal service from the minute your call comes in. With the exception of those few items remaining in short supply, we can fill all your orders quickly from stock on hand. And to assist you on any problem of steel procurement, application or fabrication, the friendly counsel of experienced Ryerson specialists is always yours for the asking.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
REINFORCING—Bars & Accessories, spirals, wire mesh
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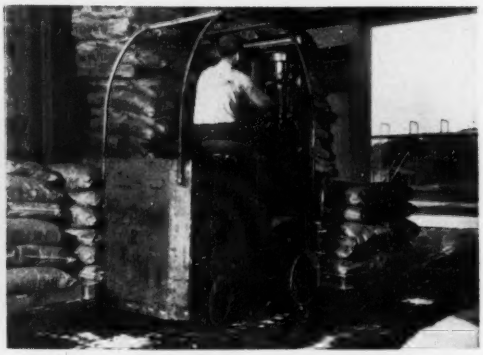
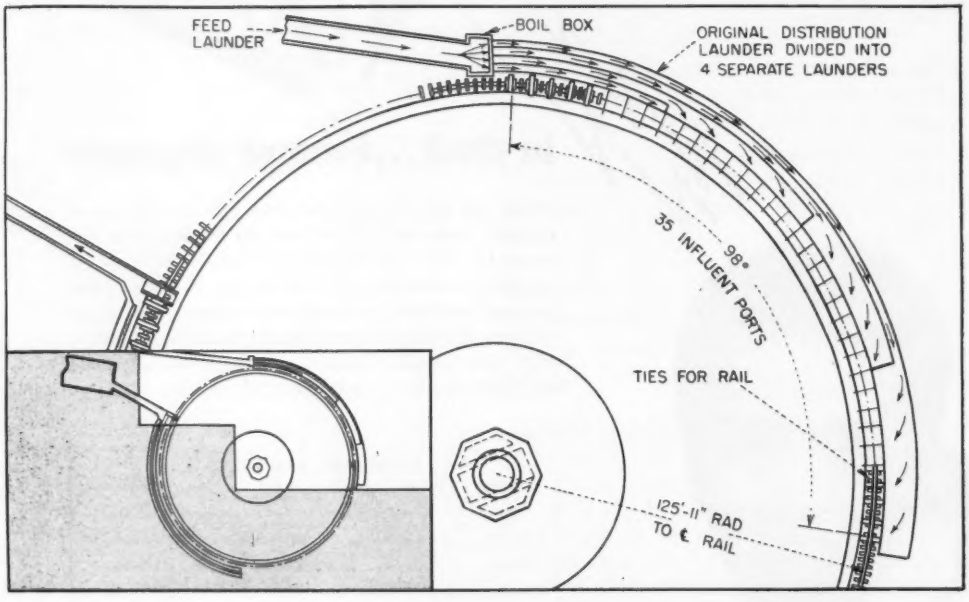
Truck Pours Tamping in Drill Holes

A LARGE COPPER PRODUCER in the United States uses this truck to haul and pour tamping into its 9-in. churn-drill holes. It dumps from a high position and has a rear chute gate which sends tamping directly into the hole. Supplier of the truck was Maxon Construction Co., Dumpcrete Division, Dayton, Ohio.



Landing Mat for Temporary Floor

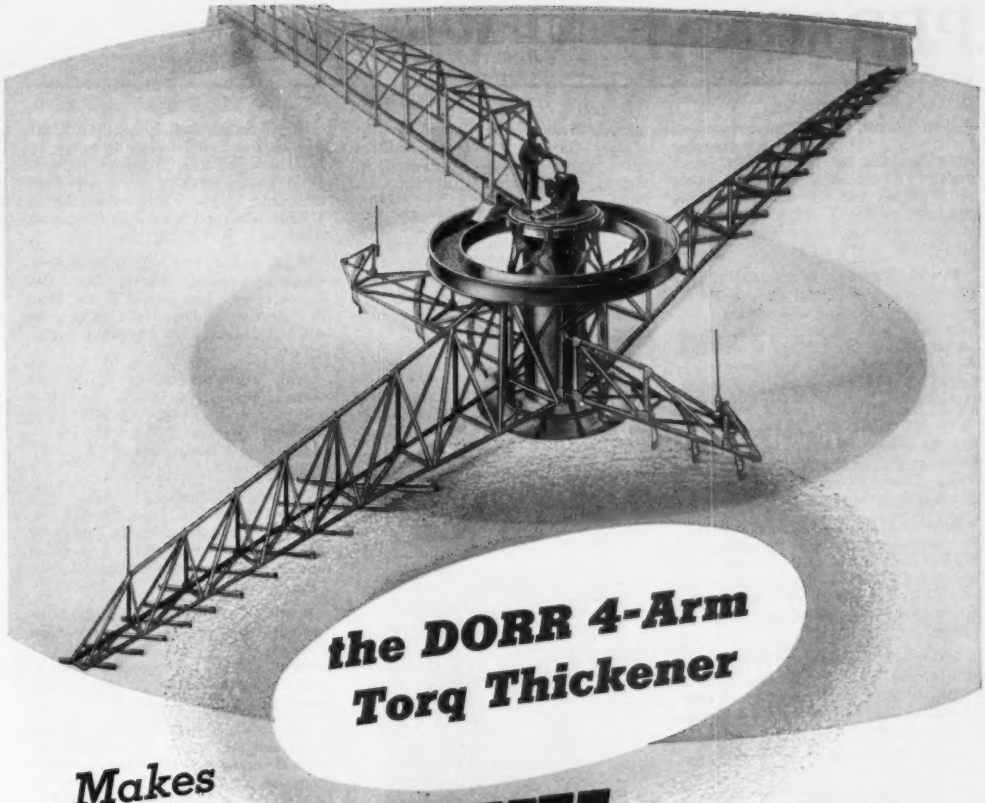
THE GROUND FLOOR of a building at American Cyanamid's Willow Island, Va., plant had not been finished with concrete. Fork-lift trucks bogged down badly in the soft dirt. So A-C installed World War II landing mat. Though not as good as concrete, it was cheap and proved fine as a temporary flooring.



Divided Feed Launder Improves Thickener Operation

TO ELIMINATE THE DANGER of overloads and bent thickener rakes, F. M. Jardine, general superintendent of Round Mountain Gold Dredging Co., suggests the simple alteration shown above.

The 250-ft. Dorr traction thickener at Round Mountain, Nev., was designed to handle material of light specific gravity—slimes. It is being used on placer sand. When it was operated with conventional feed launder and openings, the coarser portion of sands (placer tailings at 99% minus-100 mesh) settled mainly in the area near the first two or three entry ports. The result was overloading of rakes every time they passed these ports. Mr. Jardine eliminated the difficulty by having the inflow launder divided into four separate sections so that the sand was distributed over a 98-deg. arc.



the DORR 4-Arm Torq Thickener

Makes lighter Work of HEAVY Ore Tailings

To handle heavy granular solids subject to widely fluctuating feeds — note the 4-arm feature of the Dorr Torq Thickener.

Two long arms rake the outer section of the tank floor. The two short arms handle the load in the inner section, raking all the solids to a conventional center-cone discharge. All four arms are provided with the exclusive Torq feature . . . which reduces overload by continuous raking action . . . eliminates the danger of stalling and damaging the unit.

For more information about the mechanical advantages of the 4-Arm Torq and the complete Dorr Thickener line, ask us to send you a copy of Bulletin No. 3001. THE DORR COMPANY, Barry Place, Stamford, Conn.

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PERSONAL NEWS

Earl Schulz, smelter plant general foreman, and **Elmer Gray**, converter shift foreman for the Nevada mines division, Kennecott Copper Corp., have been loaned for six months by the company to the Turkish Government as smelter specialists; headquarters in Murgul.

David Mayers, with the Kaiser Aluminum & Chemical Corp.'s Trentwood plant at Spokane, Wash., has been advanced to administrative superintendent. Mr. Mayers succeeds **W. J. Edmunds**, who has been transferred to Kaiser's plant at Newark, Ohio.

Niel R. Allen, Grants Pass, Oregon, has been appointed to a four-year term on the governing board of the State Department of Geology and Mineral Industries.

Robert A. Sandberg, former executive assistant to the president of Washington State College, has been appointed northwest regional public relations manager for the Kaiser Aluminum & Chemical Corp., Spokane, Wash.

Alfred E. Nugent, formerly manager of the N&N Mining Co., Helena, Mont., is now on the geological staff of Bunker Hill & Sullivan M. & C. Co., Kellogg, Idaho.

James H. Pierce resigned as president of Pierce Management, Inc., Scranton, Pa., to become chairman of the board. **John S. Marshall**, formerly executive vice president, was elected president. **F. L. Rousselle**, formerly treasurer and secretary, is vice president and treasurer. **T. J. Welby** was elected secretary and assistant treasurer.

Stuart St. Clair and **Evan Bennett** have returned from a six-month investigation of Burma mineral deposits for Pierce Management, Inc., Scranton, Pa., and **William W. Tamplin**, **Kenneth A. Lambert**, and **Sam Hancock** have taken up two years' residence there to continue the project. **Harry J. Evans** is in Portugal on mining investigations for the firm.

M. Platisha, pit foreman at Pickands, Mather & Co.'s Danube mine at Bovey, Minn., has been appointed general pit foreman at the West Hill mine, Mesabi Range. **Richard Kirwin** has been appointed master mechanic.

Peter Warhol has resigned as superintendent for Ogelbay, Norton & Co. at Babbitt, Minn.

E. C. Lampman is now at Oglebay, Norton & Co.'s Duluth, Minn., headquarters as manager of the company's Mesabi Range operations.

Robert L. Johnson is the new mining captain at the Fraser underground mine, Oliver Iron Mining Division, Mesabi Range. **Walter J. McGuire**, formerly general track foreman, is assistant superintendent at the Hull mine.

Milton Englund, Hibbing, Minn., has been promoted to assistant superintendent of the South Agnew and Morton mines, M. A. Hanna Co., succeeding **Robert F. Anderson**, who has been transferred to the Hanna ore sales department, Cleveland, Ohio.

John A. Riddle, Duluth, Minn., with the Oliver Iron Mining Division, in the Duluth research laboratory, has joined Phelps Dodge Corp., San Antonio, Tex.

F. C. Blickensderfer, consulting metallurgist for Southwestern Engineering Co., is now engaged in starting up the Molybdenum Corporation of America's new rare-earth plant near Mountain Pass, Calif.

RICHARD W. SMITH, assistant manager of the National Chamber's Natural Resources Department, Washington, D. C., since 1946, has been named department manager succeeding David J. Guy, who recently retired.

Robert A. Blake, mill superintendent of the Mike Horse Mining & Milling Co., Mike Horse, Mont., has been transferred in the same capacity to AS&R's new Van Stone mill at Onion Creek, Wash.

T. Charles Fawcett, manager of Donalda Mines, Ltd., Quebec, has been made manager of Columbia Lead and Zinc mines near Revelstoke, B. C. **William Blair**, assistant manager of Leitch Gold Mines, Ont., is now assistant manager.

Changes at the Canadian Ingersoll-Rand Company, Limited, Sherbrooke, Quebec, factory, are announced: **George McKinstry Dick**, former manager of engineering and purchasing, has been named chief engineer. **Gordon Francis McClay** and **Malcolm Donald MacLennan**, have been appointed managers of engineering and purchasing, respectively.

T. K. Davis, Salt Lake City, Utah, has been named purchasing agent for International Smelting and Refining Co.'s Tooele smelter and other intermountain region Anaconda Copper Mining Co. operations. He succeeds the late **J. H. Colling**.

R. E. Baker, formerly mill superintendent, Getchell Mines, Inc., Red House, Nev., has joined Black Rock Mining Co., Bishop, Calif., where he will do research in tungsten metallurgy.

Max Willard, Boston, Mass., has been appointed economic geologist with the State Bureau of Mines and Mineral Resources at New Mexico Institute of Mining and Technology, at Socorro.

Thomas E. Camp, Jr., has joined Southwest Potash Corp., New York, N. Y., as vice president in charge of sales. Mr. Camp was formerly division manager of Armour Fertilizer Works, Atlanta, Ga.

Frank J. Belina has resigned as mining department chief, Empire Zinc Division of the New Jersey Zinc Co., Gilman, Colo., to become assistant mine superintendent, Pacific Coast Borax Co., Boron, Calif.

Charles R. Kuzell has been named to succeed the late **H. M. Lavender** as general manager of Phelps Dodge Corp. at Douglas, Ariz. **Walter C. Lawson** was appointed to succeed Mr. Kuzell as assistant general manager.

Delmar H. Larsen, former director of research and manager of the patent department, National Lead Co., has opened offices in Los Angeles, Calif., as a consulting chemist and chemical engineer.

Lester G. Morrell has been appointed chief of the North American Division of Region IX (Foreign Metals) of the Bureau of Mines; headquarters, Washington, D. C.

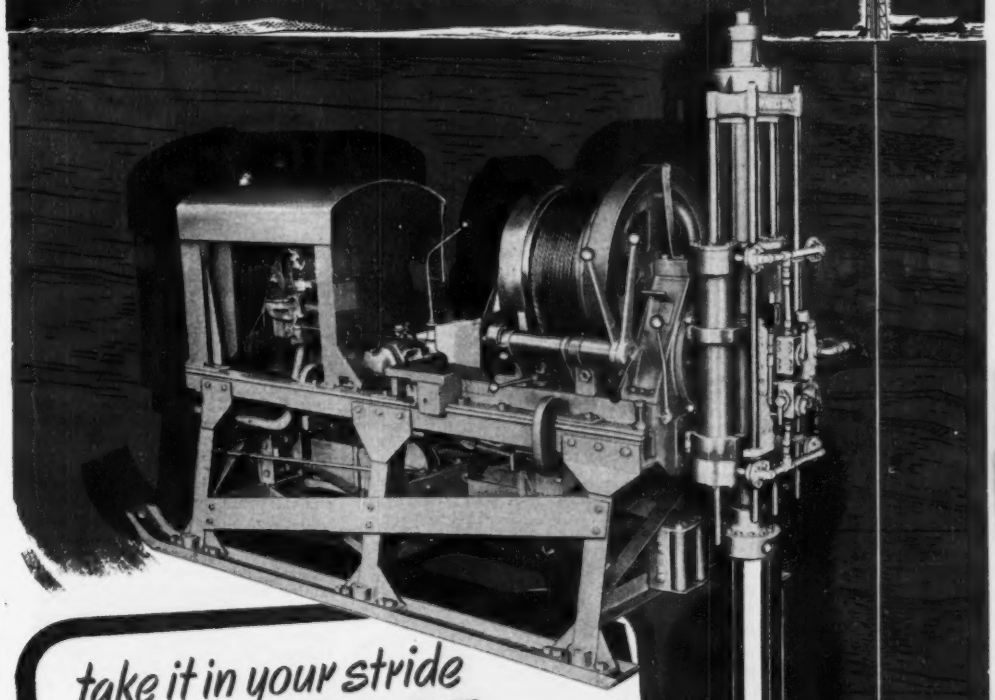
W. R. McCormick, Jr., has been appointed superintendent of Calera Mining Co.'s cobalt refinery at Garfield, Utah.

Paul A. Schreffler, formerly with Allis-Chalmers, has joined engineers sales staff, Traylor Engineering & Manufacturing Co., Allentown, Pa.

Kevin Quinn has been elected a director of Burns Bros. & Denton, Inc., New York, N. Y., associates of the Toronto underwriters of the same name.

Robert Y. Grant, former chief of the Mining and Geology Division, Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers in Tokyo, Japan, has

going down to 5,000 feet?..



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CAPACITIES:

2000 feet—6 inch hole; 5000 feet—2 $\frac{1}{4}$ inch hole. Maximum hoisting speed—850 feet per minute. Cable drum capacity—300 feet, three-quarter inch. Weight—7800 pounds.

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moved to Taipei, Taiwan (Formosa) where he is now special assistant in the Office of Chief of Mission, Mutual Security Agency, Mission to China.

Charles Will Wright has returned to Washington, D. C., from Mexico City, Mex., where he visited various mines.

James M. Blayney, St. Louis, Mo., actively identified with the Illinois-Kentucky fluorspar mining industry for more than 40 years and a former president of Fairview Lead and Fluorspar Mining Co., has resigned as president of the Rosiclare Lead and Fluorspar Mining Co. because of ill health. **J. M. Patten**, of Kansas City, Mo., and formerly consultant with White Engineering of New York, N. Y., will act as general manager.

D. W. Lindgren, formerly geologist with Oliver Iron Mining Co., Duluth, Minn., is now manager for West Indies Mining Corp., Santurce, Puerto Rico.

New officers for the American Society of Photogrammetry, Washington, D. C., are **George D. Whitmore**, president; **Alfred O. Quinn**, first vice president; and **Ford Bartlett**, second vice president.

Oscar A. Glaeser has been appointed assistant general manager, Western Operations, of U. S. Smelting Co., Salt Lake City, Utah.

New officers of the Beryllium Corp., Reading, Pa., are **Daniel D. Schwartz**, chairman of the board and director; **Matthew J. Donachie**, president and director; **William D. Gamon**, vice president; **Richard M. Quimby**, secretary and director; and **Maurice A. Hallam**, director.

Robert T. Banks, Jr., is in Belgrade, Yugoslavia, serving as MSA consultant to the Yugoslav Government on their mining and metallurgical industries.

Eskil Anderson, formerly president, Chandalar Mining & Development Co., College, Alaska, is now with Grandview Mines, Spokane, Wash., as a mining engineer and member of the board.

John R. Sullivan, formerly with Denver Equipment Co., is now shift foreman with U. S. Vanadium Co., Bishop, Calif.

John S. Lathrop, geologist, has been transferred from the California to the Wallace, Idaho, office of the American Smelting & Refining Co.

J. H. Mitchell has left the Oil-Shale Demonstration Plant, Bureau of Mines, Rifle, Colo., to join Procter and Gamble Defense Corp. as utilities engineer at Amarillo, Tex.

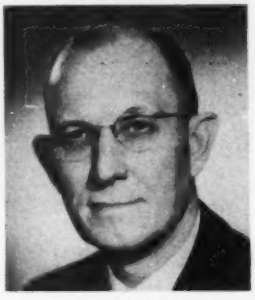
The Combined Metals Reduction Co. has announced five staff promotions in Utah and Nevada: **Sam S. Arentz**, general superintendent at Pioche, is manager of Nevada operations; **C. E. Bartlett**, assistant general manager, is director of Utah and Nevada milling operations; **Paul Gemmill**, geologist in charge of engineering at Caselton, Nev., now general superintendent of mines; **W. G. Fidler**, Caselton mill superintendent, named general superintendent of milling in charge of all Nevada milling operations; and **Frank H. Anderson**, chief clerk at Pioche, named office manager of Nevada properties.

R. F. Mitchell has been appointed maintenance engineer, Trail, B. C. operations, Chemicals and Fertilizers Division of The Consolidated Mining and Smelting Company of Canada, Ltd.

Mitchell H. Kline, acting chief, Special Minerals Investigation Branch, U. S. Bureau of Mines, has also been appointed chief of the Rare and Precious Metals Branch, Washington, D. C.

H. D. Keiser, formerly a member of the Geological Survey, has transferred to the USBM as a commodity-industry analyst in the Rare and Precious Metals Branch.

E. C. Weichel, Jr., has been appointed plant superintendent at Trail Ridge, E. I. duPont deNemours' ilmenite project, operated by Humphreys Gold Corp., Starke, Fla. Mr. Weichel succeeds **C. R. Hager**, who has been transferred to Wilmington, Del. (An article describing the plant appears on pp. 82-87 of this issue.)



NOEL S. WORRELL has been elected vice president in charge of traffic for American Zinc, Lead and Smelting Co., St. Louis, Mo.

CORRECTION

Steep Rock Iron Mines, Ontario, expects to attain an annual production of 3½-4-million tons of high-grade iron ore in 1956, not in 1953, as stated on page 84 and again on page 85 of the article by M. S. Fotheringham, president and general manager, in the April, 1952 issue of *E&MJ*.

OBITUARIES

John H. Flanagan, 75, purchasing agent for the Silver King Coalition Mines Co., Park City, Utah, died in Long Beach, Calif., on March 7. Mr. Flanagan joined Silver King in 1901, moving to Park City from his native Philadelphia. He became timekeeper of Park City operations and was appointed purchasing agent for the company in 1924.

John G. Munson, 67, former vice president, raw materials of U. S. Steel Corporation of Delaware, now merged into U. S. Steel Co., died March 29 in Pittsburgh, Pa. A graduate of Yale University, Mr. Munson served 31 years with the U. S. Steel organization prior to his retirement on Dec. 31, 1950.

Alfred H. Paradis, director of Asbestos Corp. and East Malartic Mines, died suddenly in Miami, Fla. A resident of Montreal, he was connected with many industrial concerns and was widely active in civic and philanthropic affairs.

A veteran of early Cobalt days, and later connected with properties in other parts of Canada, **Ernest S. MacCarthy** died at Ashburn, Ont.

H. Rupert Bain, Toronto financier and president of the National Life Assurance Co., died in Mexico City at 54. Senior partner in The Toronto Stock Exchange house of Bain, Newling & Co., Mr. Bain was active for 20 years in mine financing, best known for his sponsorship of Pickle Crow Gold Mines.

Harrison M. Lavender, 62, director and vice president of the Phelps Dodge Corp., died at his La Jolla, Calif., home on March 21. On March 1, Mr. Lavender had been relieved of his duties as general manager of the company's mining division.

Henry Knowles Bourne, former partner and later vice president of Oglebay, Norton & Co., and also a director of the Republic Steel Corp., died March 8 in West Los Angeles. Mr. Bourne had been with the company since 1893 as a billing clerk.

Robert Whitney Hanington, 77, died of a heart attack on March 26 in Denver, Colo. Mr. Hanington, a Yale graduate and mining and milling engineer, was vice president and treasurer of the Hendrie & Bolthoff Company of Denver. He had been associated with the company for 55 years, the last year and a half in semi-retirement.

William McKinnie Green, 63, manager of the ore sales department of the Cleveland-Cliffs Iron Co., died in Tampa, Fla., on March 13. A Yale graduate, Mr. Green joined Cleveland-Cliffs in the ore sales department in 1911 and became manager in May, 1950. He was on an advisory committee of the Lake Superior Iron Ore Association.

Herbert V. Hughes of South Pasadena, Calif., died on March 19 at the age of 70. Educated at Ottawa University, Mr. Hughes was associated with the Telegraph Mining Co. of Sierra County, Calif.

Frank F. Colcord, director and former vice president of the U. S. Smelt-

TRY STRONG, SAFE O-B CLAMPS FOR STEADY POWER SUPPLY

Every O-B Ground Clamp gives you three important advantages: a shake-proof, dependable connection, high current-carrying capacity, and safety. See what each feature means for you:

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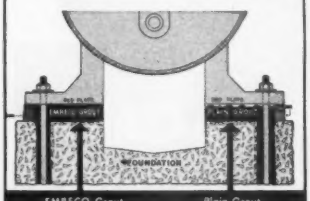

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ing & Refining Co., died suddenly on March 21 at San Marino, Calif., at 74. Mr. Colcord graduated from the Massachusetts Institute of Technology in 1898. In 1900 he became chief chemist for American Smelting & Refining Co.'s Perth Amboy plant. He joined the USSR&M Co. in 1910, and retired as head of the sales department in 1947, continuing as a director until his death.

LETTERS RECEIVED

Dear Sir:

I read with great interest "A New Way To Interpret the Results of Placer Sampling" by Mr. J. E. Harding. I consider there is a lot in it, but a bit too much for practical field calculations.

Since the late J. E. Thorne produced his book, *Testing and Estimating Alluvials*, in 1926, I have in all my work been using this formula, combined with the Field Log favored by California; in this instance, the Union Construction Co. form given in the above technical publication.

I have tested out the simplicity of the Thorne formula in West, and East Africa, South America, and elsewhere with all types of placer mining for tinstone, gold and platinum.

On page 96 of your January, 1952, issue, I have taken the best values of gold obtained by the drill from that particular log and obtain 383.2 mgs. Au over 90 ft. This value becomes less for 94 ft., i.e. $\frac{383.2 \times 90}{94}$

Now since a cutting shoe of external diameter 7.5 in. was used, I get a figure of 88 ft., the equivalent length of that size casing for a cubic yard representing gravel. I then take $\frac{88}{94}$ as the fraction to get the value of gold per cubic yard, viz. $\frac{383.2 \times 90 \times 88}{94 \times 94}$

which equals 360 mg. Au approximately per cubic yard. This figure compares very favorably with the figures obtained in the calculations in the article on p. 97, viz. 364.33 mg. per cubic yard by drill, and 347 mg. per cubic yard by dredge.

My calculations of 360 mg. Au are just between the two other figures and are obtained without any factors or other involved calculations.

S. O. HATTON

Calgary, Alta.

Mr. Harding's method of calculation was aimed at eliminating "common sense" factors and developing an accurate reliable result. To us it seemed to fulfill that objective, but in placer sampling, each to his own taste!

Editor

Dear Sir:

I was very much interested in the Nov., 1951, issue of E&MJ, especially in the piece about old-time drilling contests. I saw the El Paso drilling contest which Mr. Richie mentions as the record-breaking two-hand contest. It was held in the public square in front of the Orndorff Hotel. As I recall it, the Tarr Brothers drilled against Chamberlain and his partner. One of the drillers missed the drill and hit his partner's hand, but they kept right on with the drilling.

I also saw Yockey drill single-hand the next day. I recall that I was amazed at his timing in changing drills—seemed never to miss a stroke, especially with the shorter drills.

The Mining Congress was the core activity around which El Paso built up a big midwinter show which I think ran for several years as "Sunshine in January." In addition to the drilling contests, they also put on a big rodeo which attracted the best riders and ropers of the Southwest. A badger fight at which some brave senator from Washington pulled the fierce badger was one of the attractions one evening. With cowpunchers and hard-rock men filling the town, things were lively, to say the least.

I took a minor part in the activities of that week as quarterback on the New Mexico State football team. We played the 29th Infantry team from nearby Ft. Bliss and were rolled around considerably by their heavy bruisers. The sandburrs that clung to the ball every time the center snapped it back to me are still a painful recollection.

Amongst other handicaps besides sand-burred footballs, were alkali-covered playing fields such as the old fairgrounds in Albuquerque. Shortage of substitutes and the rules then current meant that you played until you were carried off the field or were ordered off—no platoon system in those days.

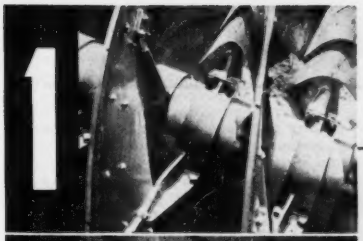
But the real show was the drillers and Mr. Richie and you are both to be commended for bringing them to life again.

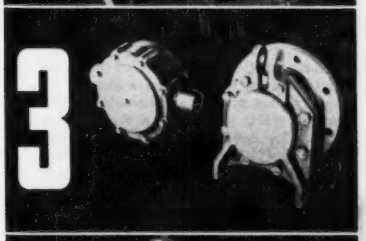
Oh, yes, I noted that Mr. Richie used the terms "single-hand" and "double-hand" in his letter; I recall them as "single-jack" and "double-jack" drilling. I suppose there's no connection with "Cousin Jack," for those boys from Wales or Cornwall swung a mean hammer in those days.

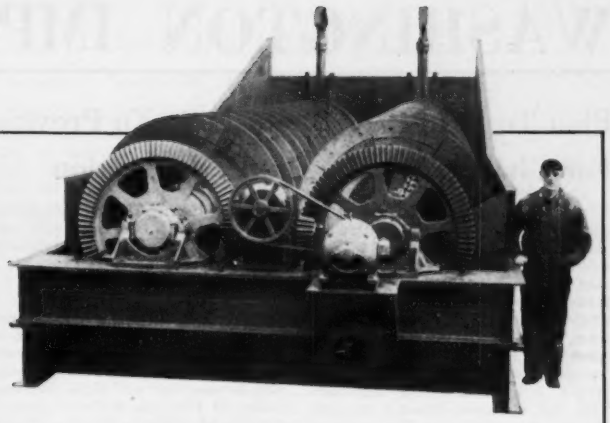
Many things then current would seem strange today perhaps; such as thawing dynamite (crystallized) in a camp stove or crimping fulminate or mercury caps with your teeth. You know, it might be interesting to run a throw-back column to pick up other reminiscences of the old-timers. Of course you might get some tall tales and it would be difficult to assay them for truthful content.

EARL A. GRAHAM

Falls Church, Va.







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WASHINGTON IMPACT

Plan To Extend U. S. Stockpile To Provide For Civilian Needs Is Under Discussion

A PROPOSAL TO SET UP a special civilian category of materials within the national stockpile, for release to nondefense industry after military goals have been met, is being seriously discussed in high defense mobilization echelons. Under the proposed program, GSA Administrator Jess Larson, who acts as the stockpile's custodian, would have personal authority to sell abundant materials from the stockpile directly to nonessential manufacturers. The national stockpile is now a strategic reserve for exclusive military and defense-supporting use, and only the President can release materials.

GSA claims that some small fabricators recommend such a stockpile category to guarantee supplies. Most private industry, however, is against the proposal. It's just more government interference in business and another trend toward socialism, they say.

Within the government, there are varied points of view on the proposal. The proponents say the program would provide an uninterrupted flow of materials to U.S. industry at low cost. The critics contend that a centralized, chain-store purchasing system for private manufacturers would be set up at government expense and that the government would also bear inventory costs for private business. The proponents reply that the government could add on administrative expenses when releasing the materials to industry.

A third element in government asserts that the proposal is strictly academic at this time because we still can't get enough materials like cobalt, tungsten, nickel, molybdenum, copper, etc., for immediate use.

Broad Charter Rights

DMPA's executive charter is broad enough, some contend, to back up an interpretation that sale of materials from the stockpile for nonessential civilian uses is legal. But most officials believe that legislation would be required because it wasn't the original law's intent to sell stockpiled material to industry in general.

Stockpiling will not be cut back any appreciable degree after June 30. The administration has asked Congress for $940-million for stockpiling activities for fiscal year 1953. During fiscal 1952, $975-million will be spent.

The House has already cut $22-million from the request. But this is considered a slap at the stockpile's administrative setup, not at the stockpile principle itself. The administration argues that as the stockpile gets closer to ultimate goals, maintenance costs (depots, guards, etc.) increase.

DMPA'S Foreign Policy

DMPA's far-flung foreign procurement organization is beginning to take shape. Charles E. Stott, former American Metal Co. vice president who headed the old ECA Strategic Materials Division, and who now is director of DMPA's Foreign Expansion Division, has broken his operations down into four regions: (1) Mexico, Central America, and the Caribbean area, including the Guianas on the South American mainland; (2) South America, excluding the Guianas; (3) West Europe, Africa, and the Near East; and (4) Southeast Asia, the Philippine Islands, Australia, and New Zealand.

Stott doubles as director of Region 1, with headquarters in Washington and a district office in Mexico City.

Headquarters for Region 2 will be in Lima, Peru, with field offices opening in other republics as needs develop. Chief possibilities for these are in Santiago, Chile; Rio de Janeiro, Brazil; and La Paz, Bolivia. A regional director has not been named yet, but temporary consultants for DMPA are already making field investigations.

DMPA's Region 3 covers former ECA areas, and has inherited much of the old agency's staff. Headquarters have been moved from Paris to London, however, and Brig. Gen. Thomas B. Wilson, a top-level GSA official, has been named regional director.

Probable headquarters for Region 4 is Singapore, with proposed branch offices in Canberra and Manila. DMPA field engineers are now surveying the region's mineral possibilities to determine how big an administrative setup will be needed to handle the workload.

DMPA's Foreign Expansion Division has the broad responsibility of procuring materials for the U.S. stockpile and developing new sources for minerals and metals that are unobtainable in the United States and Canada. GSA's emergency procurement service will actually do the spot buying, however. DMPA took over $200-million worth of pre-1952 foreign projects and contracts from ECA.

Tight on Exploration

When the now-defunct Defense Minerals Administration set up shop last summer to stimulate domestic exploration of critical minerals and metals by underwriting at least half of prospecting costs, some people thought the government had gone into the grubstaking business.

But that's not the case. By the end of March, 1952, DMA and its successor agency, the new Defense Minerals Exploration Administration, had received 1,267 applications for contracts. The agencies have proved to be tight-pocketed about the whole deal. They have approved and executed only 246 exploration contracts. Not all of these are now in effect, for many have been cancelled. DMEA is still processing 408 applications and has denied 478. Applications were withdrawn in 135 cases.

Some quarters on Capitol Hill fear that DMEA's conservative policy is gumming up the works. They want the agency to put the minerals exploration program in higher gear.

But only $10-million of defense mobilization funds were allocated to underwrite domestic minerals exploration work during the fiscal year 1952. The 246 approved contracts account for $7,820,918. Of this sum, $2,695,760 have gone out as government contributions toward the cost of exploring for lead and zinc, and $1,084,373 for tungsten.

The total value of the 246 approved contracts is $13,224,403. In other words, private prospectors are bearing $5,403,485 of the exploration costs.

DMEA considers personal labor and equipment as part of the prospector's funds. The agency requires monthly progress reports, and hands out government funds to cover expenses on the basis of these reports. The contracts run from a few months to two years, and DMEA makes no advance payments.

Only three discoveries have been certified since the exploration program began: Manganese on the property of the Westmoreland Manganese Corp., near Batesville, Ark.; strategic mica at the Reid-Mary mine of the Pitt Mica Corp., near Franklin, N.C.; and tungsten on the holdings of G. McGuire Pierce in Dinkey Creek, Fresno County, Calif.

Metals for Equipment

During World War II, expanded mining operations were continually hampered by shortages of mining machinery. The war planners failed to synchronize mining expansion and machinery production.

This problem has been avoided, for the most part, in the present emergency. The metals allocators have recognized the essentiality of mining machinery more keenly, and have permitted output to run at about 125% of the pre-Korea level during 1951, and are boosting it to 145% for 1952. (The dollar volume of mining machinery produced in an average

quarter during the first six months of 1950 was $58½-million. The figures on post-Korea output have been adjusted for price changes.)

The defense mobilizers have avoided the bottleneck of equipment shortages in mining expansion, to a great extent, by vesting the dual responsibilities of determining equipment needs and administering the production of this equipment in one government official. He is Harold A. Montag, who wears two hats in the government's defense mobilization setup, as director of DMPA's mining requirements division and as director of NPA's mining machinery division.

The mining industry is getting a black eye, through no fault of its own, because of loopholes in the mining laws, which permit people outside the industry to get possession of public lands for recreational or commercial purposes under the guise of mining claims. This is the contention of the Forest Service and the Bureau of Land Management, who have gotten Rep. Ken Regan (D., Tex.), chairman of the House Subcommittee on Mines and Mining, to introduce H. R. 4916.

The bill would remove sand, stone gravel, pumice, pumicite, and cinders — the minerals most frequently affected by bogus claims—from the mining laws. The House Subcommittee will hold hearings on the bill this month.

Too Many Cooks

As the government mining program accelerates, the organizational confusion grows, and the need for one central authority wholly responsible for and administering all phases of the mineral and metal programs becomes more and more evident.

A recent congressional tally shows that 53 federal agencies and interagencies have their hands in mining affairs. These include several advisory councils and nine organizations under the executive office of the President. In addition, five major U.S. Government committees and nine major international groups and subgroups have a significant interest in strategic and critical minerals and metals, and exert great influence on what the government does to the mining industry.

On top of this, 14 or more Senate and House committees and subcommittees are also involved in mining, and ride herd on what the 67 other organizations do.

Answer Mica Critics

GSA admits the charge of New Mexico mica miners that only ruby mica is being purchased for the stockpile. The agency says this is in accord with Munitions Board specifications that call for stockpiling only top quality mica.

They contend that ruby mica is superior to other types because it requires the least amount of processing before ultimate use. Since the stockpile is a last-ditch reserve, only top grade materials go into it when great variations in quality exist, they say.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

WSB UNDER FIRE: The Wage Stabilization Board will not come out of the steel situation intact. Recommendations of union shop and 26¢ "package" increase, which steel companies wouldn't "buy," forced Truman to seize the industry under questionable power Congress, disturbed, will do something about it.

WSB WILL CHANGE: What you can expect Congress to do is this:

- Extend wage-price controls with some modification.
- Reorganize WSB so that public members will make up a majority and not have to compromise with industry or labor members to make a decision.
- Take away from WSB the handling of labor disputes.
- Define or limit the President's power to seize.

SEIZURE DAMAGES: Steel companies will be entitled to "just compensation" under the fifth amendment. In the seizure of 103 midwest trucking companies during the war, "just compensation" has been determined to cover more than just losses. The trucking companies are now being compensated by the federal government on the basis of "fair rental" during the seizure period.

GARDNER-DENVER DISPUTE: With help of WSB panel, this mining equipment maker reached settlement with CIO Steel Workers on increments between job grades. There will be four 5¢ increments and 10 of 6¢.

PRODUCTIVITY: Output per man-hour in copper mining and milling kept rising in 1950. Write Bureau of Labor Statistics, Washington 25, D. C., for latest report: "Productivity in the Copper Ore Mining Industry, 1935-50."

WATCH McCARRAN: Quietly, investigators of the McCarran Internal Security Committee are getting ready to put the congressional spotlight on communist influences in Mine, Mill and Smelter Workers.

PRESSURE ON NLRB: Justice Department thinks the National Labor Relations Board could meet communist problem by decertifying unions under communist domination. (Canada did it.) Secretary of Labor Tobin says the same. So does Sen. McCarran.

NLRB TIGHTENS RULES: Gradually, NLRB is putting the squeeze on left-wing unions. In Sunbeam Corp. case, NLRB revoked bargaining rights of union for failing to list trustees and sergeants-at-arms as officers who had to sign non-communist affidavits. Now a trial examiner goes further in the Square D case. He says you can insist in your contract that all persons who speak for the union—at any level—must sign non-Communist oaths.

NO COPPER STRIKE? Mine-Mill isn't figuring on a strike this year. It expects copper industry to come to terms readily in order to avoid seizure and imposition of higher wages by government. Important bargaining won't get under way until late May.

WAGE DEMANDS: Major Mine-Mill economic demands are these:

Wage Rates: 25¢ more.

Area Differentials: Eliminate them.

Vacations: Two weeks after two years, plus extra day for each year after two.

Night Shift: Double the premiums.

Welfare Benefits: Additional 4¢ an hour for sick leave and other benefits.

Paid Holidays: Two more.

Sundays: Time-and-a-half for all Sunday work.

LABOR FOR KEFAUVER: Where labor unions indicate, their preference of presidential candidates is usually for Sen. Kefauver. Teamster boss Dan Tobin is for him. So are AFL textile workers. Left-wing unions which backed Wallace last time haven't got a candidate this year. Mine-Mill won't back any presidential candidate.

MINE-MILL MUST PAY: Fines adding up to $37,000 were imposed on Mine-Mill, its local 890, and individual officers and members for violating a court injunction against coercive picketing in the long Empire Zinc Co. strike.

KENNECOTT ELECTIONS: Over Mine-Mill objections, NLRB will hold bargaining elections requested by AFL unions in two Kennecott facilities.

At the Ray mines, NLRB carved out a craft unit of various kinds of truck drivers, grease men, oilers and tire service and repairmen.

At Bingham Canyon, professional, technical and clerical employees will vote for or against the AFL office employees international unions. Professional employees will also decide if they wish to be included in a single bargaining unit with the group.

there's a tool here
and a tool here
NOW! complete
your drilling equipment
with a drill steel that's
a tool steel CRUCIBLE—◆CA◆—
DOUBLE DIAMOND HOLLOW DRILL ROD
That's right! Complete your drilling equipment with the finest, toughest hollow drill rod made. Save expensive tungsten carbide bits, time . . . and money. New, Crucible Double Diamond puts drill rod in the tool steel class . . . because Double Diamond is an *alloy* drill rod made by drill rod specialists to tool steel specifications.
Find out first hand about this advance in hollow drill rod. WRITE, PHONE or WIRE! Do it now!
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52 years of Fine steelmaking
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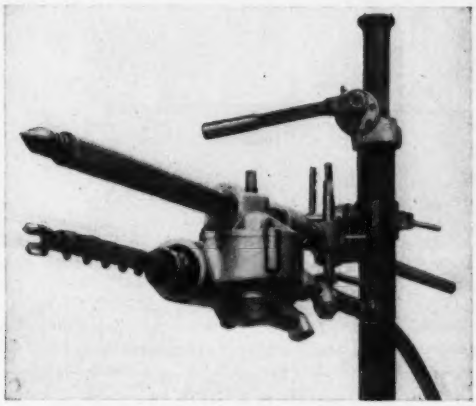
NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

FEATURE

Rotary Drilling Takes on Medium Hard Rock (1)



WE SAW . . .

ROTARY DRILL is pushed into rock along the feed bar. Feed bar is held in position by quick release ratchet on light, quick setting prop. Clutch and gearbox mechanism are built into drill.

WE WROTE . . .

Victor Products (Wallsend) Ltd.
Wallsend-on-Tyne, England

Dear Sirs:

We noted the very interesting advertisement of your rotary drill which states that the equipment is useful for materials having a "high hardness factor." What materials have been drilled with these units?

What type of bit do you use on the steel?

Thank you very much for your attention to this inquiry.

Very truly yours,

WE LEARNED . . .

Dear Sir:

Very many thanks for your letter in which we note you require additional information on our power feed rock drilling equipment.

We solely manufacture rotary drilling equipment both compressed air and electric. Constant research and world-wide experience show us that more and more stones are coming within range of our equipment.

Although it may not be a perfect method of doing this, we calibrate all results from the widest possible field against a scleroscope method of testing the material to be drilled and we find that we can get a very clear guide as to what we can or cannot drill.

For example, providing conditions are suitable for the introduction of rotary drills, we can drill:

Limestone (Medium Hard)—1 ft. per minute.

Sandstone (Medium Hard)—9 in. per minute.

The above figures are of course approximate. At present granite is outside the range of rotary drilling equipment.

It is to be appreciated that rotary drilling differs from percussive drilling in that a rotary drill has to be pushed into the work, or alternatively, a back pressure has to be overcome. As progress is made up the hardness scale, the job changes from a hand-held proposition to something requiring a mechanical means of applying pressure, i.e. a feed mechanism, which means some method of support, generally a prop. Consequently many stones are capable of being drilled by rotary means, but because of the impossibility of selling a support, are not an economical proposition.

For stone drilling a recent development has been a power-fed drill available for electric or compressed air motive power. We take the view that the average miner and underground mechanical engineer wants the simplest possible equipment, and we believe we have gone a long way to provide this. It may not be the answer for power drilling in main road development, but it is proving the answer for what might be termed secondary work.

With all our rotary drills, we use a twisted steel rod and a twin-legged tungsten carbide tipped drilling bit.

We trust that the foregoing is in line with your requirements and will be only too pleased to answer any further questions you may care to ask.

Yours faithfully,

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oils

UNIT Caterpillar D13000 diesel

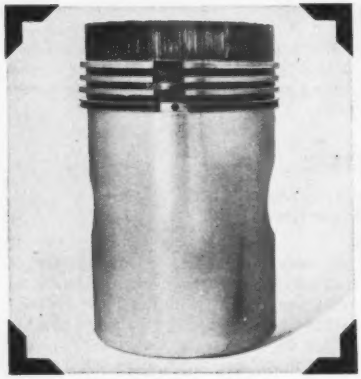
OPERATION Operating 75 KW generator

CONDITIONS Constant speed – varied loads & temp.

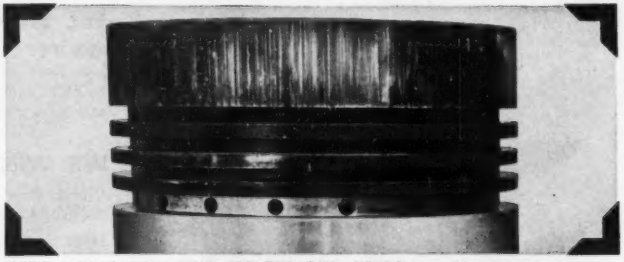
PERIOD 2119 hours

FIRM Lusitania, San Diego, Calif.

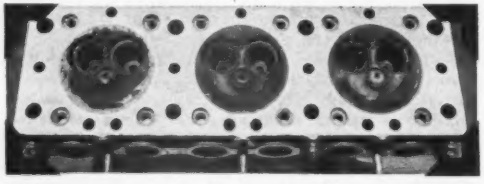
Ring-sticking stopped, wear cut in heavy-duty engine



AFTER 2119 HOURS on RPM DELO Supercharged-2 Lubricating Oil, this representative piston from a D13000 Caterpillar indicates the clean condition of lubricated parts of the engine. All 24 rings in the engine were free!



ONLY 0.0002 INCH WEAR PER THOUSAND HOURS was the average wear-rate on cylinders in the engine during the 2119-hour run, although usual drain periods were extended to 1000 hours. Oil temperatures averaged 175° F. to 180° F. Note the open oil-return holes and grooves (above) and lacquer-free piston skirt (left).



CYLINDER HEAD from the engine after the run. RPM DELO Supercharged-2 is recommended specially for heavy-duty engines where fuel-sooting or other deposits, high temperatures or other conditions cause operational problems and wear.

How RPM DELO Oils keep engines clean and prevent wear

A. Contain special additives that provide metal-adhesion qualities...keep oil on parts whether they are hot or cold, running or idle.

B. Anti-oxident resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean, helps prevent scuffing.

C. Special compounds stop corrosion of any bearing metal, and oil foaming in both wet and dry sump engines.

There is an RPM DELO Oil to meet every heavy-duty engine operation condition.

FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

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FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

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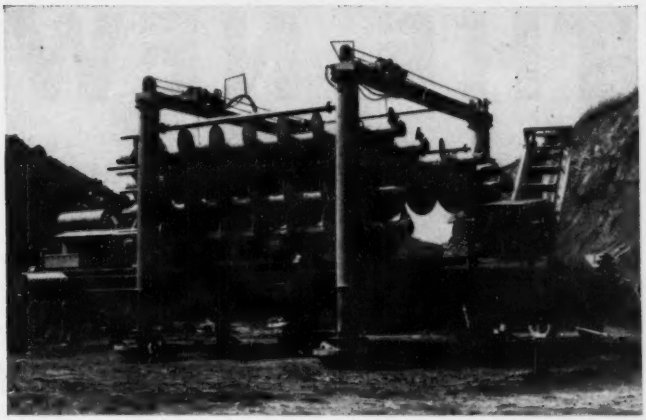
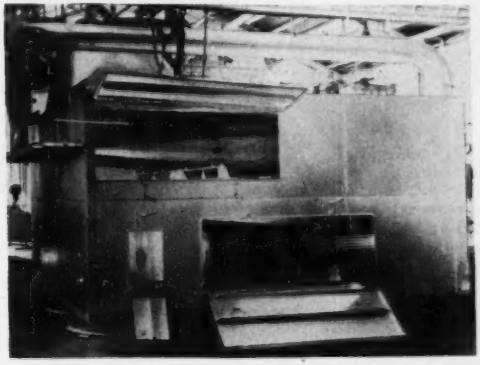


GIANT AUGER. Soft rock men may find application for this coal auger, capable of drilling 28 to 42-in. dia. holes to produce from 50 to 100 tph. Made by Grafton Coal Co., Clarksburg, W. Va., Model 42 of the Compton auger features two improvements: (1) Shorter frame and auger lengths mean less weight, lower price, greater flexibility. (2) New cutter-head permits faster penetration for greater output, lower power consumption.

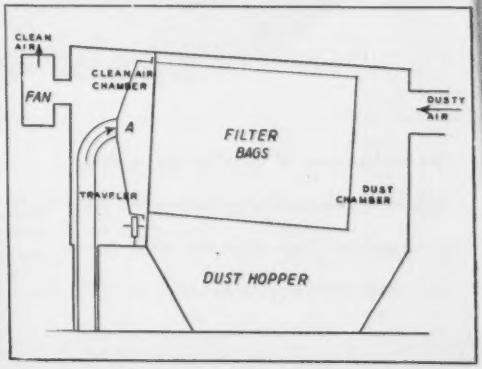
The frame is 4½ ft. long, 20 ft. wide, and 14½ ft. high. The 22-ft. long auger sections have an effective drilling length of 21 ft. A 225-hp. Cummins diesel and a 54-hp. Hercules gasoline engine fill power requirements. Price, including nine auger sections is $73,717. (2)

MOTOR-SCRAPER. This 13-cu.-yd. scraper can travel 25 mph loaded. Features include power steering, synchronized brakes on tractor and trailer wheels. Made by Heil Co., Milwaukee, Wis. (3)

SCOOPMOBILE is all-hydraulic, has single boom operation. Lift capacity is 4,000 lb., discharge height, 8 ft. Uses ¾-yd. scoop. Hydraulic steer, full visibility aid driver. Mixermobile Mfr. Portland, Ore. (4)

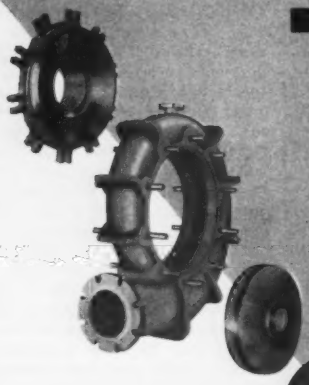


AERODYNE DUST COLLECTOR keeps draft loss low in cleaning stack gases. Flexible in design, with sturdy construction, but easily handled filter elements, the unit can be installed in limited spaces at low cost. Green Fuel Economizer Co., Beacon, N. Y. (5)



DYNACLONE DUST COLLECTOR. Traveling device across open end of filter bags, reverses airflow in one bag at a time. Constant cleaning assures uniform suction at dust sources, eliminates bag shaking for longer service. W. W. Sly Mfg. Co., Cleveland, Ohio. (6)

THE NEW GIW SLURRY PUMPS



The pumping of finely divided, highly abrasive solids has become a major problem in the mining world. It is also often desirable to pump these slurries at high solid concentrations and over a wide range of heads and capacities.

Recognition of these circumstances has led Georgia Iron Works Co. to design a completely new line of pumps for the job.

The performance of these pumps is documented by two years of laboratory and field investigations. Their capacities range from 50 to 8000 GPM against heads up to 150'.

Write for our illustrated booklet describing the Slurry Pumps. We solicit your inquiry and if you wish, there is a representative near you who will call.

GEORGIA IRON WORKS CO.
AUGUSTA EST. 1891 GEORGIA

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

LOCOMOTIVE DATA. If Goodman Mfg. Co.'s bulletin MH404A had only the performance chart on page 17, it would be well worth putting in your files. For one thing it shows in terms of tonnage, the difference made by the type of bearings on your car. But in addition, the 20-page booklet has a lot of other information on Mancha's Little Trammer locomotives. (41)

HEATING UNIT FOR VIBRATING SCREENS. How to save down-time, and wear and tear on your screen because of blinding, is the message Allis-Chalmers has for you in their bulletin on the "Therme-Deck" heating unit for vibrating screens. Applications of the unit to prevent blinding are illustrated. (42)

NYLON BEARINGS. Advantages, operating principles, design limitations and applications of "Nylined" Bearings are discussed in this four-page folder released by Thomson Industries, Inc., Manhasset, N. Y. (43)

COMBUSTION CONTROL. Details of tried and proven automatic combustion control techniques for oil and gas-fired boilers are available in a 24-page bulletin (No. 1023) issued by Bailey Meter Co., Cleveland, O. Comprehensive illustrations and descriptions show nine typical firing methods and 16 major control equipment components. (44)

RATIO TOTALIZER. This mechanism combines input control pressures and spring forces to produce an output control pressure based on addition, subtraction, multiplication or division of the input forces. Bulletin 5462 of the Hagan Corp., Pittsburgh, Pa., describes and illustrates how this little marvel works. (45)

NON-CORROSIVE PIPE. Lightweight, flexible, durable, is the way Plastex Pipe and Extrusion Co., Columbus, O., describes its "Plastex" pipe. A four-page folder illustrates the product and gives relevant data. (46)

MOLYBDENUM DISULPHIDE LUBRICANT. A liberal number of applications of "Moly-sulphide" as a lubricant in shop and field are described and discussed in this presentation by Climax Molybdenum Corp., New York, N. Y. (47)

MATERIALS HANDLING. Pettibone Mulliken Corp.'s (Chicago, Ill.) claim to "the world's most complete line of material handling and processing equipment" is supported by this 36-page catalog of their equipment in action, plus operating details. (48)

LONG-HOLE DRILLING. How to drill long holes, from 20 to 150 ft., with tungsten carbide "Rok-Bits," long hole drilling tools, and standard percussion type drills, is covered in a four-page bulletin offered by Rock Bit Sales and Service Co., Philadelphia, Pa. Holes can be drilled in any type rock, in any direction, in two standard sizes, 1⅞ and 3 in., says the manufacturer. (49)

LOCOMOTIVES. If you're shopping for a really big locomotive, you'll want to send for bulletins DI-200 and DL-2, offered by Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. The folders show locomotives ranging from 135 to 1,600 hp., and conveniently list essential details. (50)

AUTOMATIC BACKWASH SAND FILTER. This filter has a compartmented sand bed and a traveling backwash mechanism which cleans one compartment at a time while the rest of the filter bed operates normally. Catalog 46-A gives pictures, diagrams and operating data. Hardinge Co., Inc., York, Pa. (51)

DIAPHRAGM PUMP. Basically a pump, the "Pulsafeeder" will do the work of a chemical feeder, a meter, a filling machine, a proportioner and a sampler. It requires no stuffing box. A new bulletin published by Lapp Insulator Co., LeRoy, N. Y., describes and illustrates the unit and lists applications from handling molten metals to corrosive chemicals. (52)

CRUSHERS. Bulletin 12-C gives thorough coverage to the complete line of crushers made by Stephens-Adamson Mfg. Co., Aurora, Ill. Of special interest is the latest addition to the S-A line, the double rotor Knittel crusher for sticky materials. (53)

SAWS AND FILES. "How to choose and use tools for longer tool life" is the theme of the Disston saw, tool and file manual issued by Henry Disston & Sons, Inc., Philadelphia, Pa. Handsaws, band saws, files, rasps, trowels and what-have-you, are discussed in this manual. It also covers the equipment for keeping such tools in shape. (54)

FANS. Here is a catalog, price sheet and engineering bulletin describing 30 fan types in over 300 sizes. Included are specifications, installation diagrams and photographs plus extensive information for proper selection of fans for almost any use. Chelsea Fan & Blower Co., Inc., Plainfield, N. J. (55)

ANTI-CORROSION STEELS. Results of six series of atmospheric corrosion tests are presented which evaluate the durability of sheet specimens of low alloy steels containing nickel and copper. This is an ASTM reprint of a

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after August 1, 1952, if mailed in U. S. or Canada.

Engineering & Mining Journal—May, 1952

NOT GOOD AFTER AUGUST 1, 1952—If mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	29	36	43	50	57	64
2	9	16	23	30	37	44	51	58	65
3	10	17	24	31	38	45	52	59	66
4	11	18	25	32	39	46	53	60	67
5	12	19	26	33	40	47	54	61	68
6	13	20	27	34	41	48	55	62	69
7	14	21	28	35	42	49	56	63	70

My Name ..... Position .....

Company .....

Address .....

paper by Messrs. Pilling and Wesley of the research laboratory of International Nickel Co., Bayonne, N. J. (58)

"ABC" OF MOLYBDENUM LUBRICATION. "Abstracts, Bibliography and Case Histories of Liqui-Moly (Molybdenum Disulfide) Lubrication" representing a couple of years of research in the field, is offered by Lockrey Co., Southampton, N. Y. (57)

TRUCKING COSTS. "Estimating Production and Costs of Material Movement with Euclids" is an attractive book containing many useful charts, illustrations, formulas and reference tables. Although intended for making estimates for Euclid equipment, estimating methods and formulas can be applied to equipment of other makes. Euclid Road Machinery Co., Cleveland, Ohio. (58)

BULLETINS. If you want to liven up your bulletin boards, catch the attention of your workers, send for this portfolio of illustrated flash bulletins. They are amusing and attention-getting for any kind of message to the men in mine or plant. Carr Speirs Corp., Stamford, Conn. (54)

INSTRUMENTATION. What are you trying to measure: pH, speed, voltage, power, current, smoke density, thickness, strain, . . . ? Bristol Co., Waterbury, Conn., has published a bulletin P1246 describing its line of Dynamaster electronic potentiometers and bridge instruments to measure quantities of this type in plant or laboratory, in process or research. (62)

FHP GEAR-MOTORS. An eight-page, two-color bulletin of fractional horsepower gear motors, listing 61 standard models from which to choose, can be had from General Electric Co., Schenectady, N. Y. It outlines a simple method for determining correct horsepower requirements using a pipe wrench and a fish scale. (61)

RADIATION COUNTER TUBES. Here is practically everything you could want to know about "Amperex" radiation counter tubes; how they're made; how they're used; sensitivity; performance curves; and operating data. Amperex Electronic Corp., Hicksville, N. Y. (62)

WATER TREATMENT. This non-chemical water treatment process and equipment is claimed to eliminate water scale problems with practically no cost of operation, no continuous attention, no labor and no materials. Ten of the most frequently asked questions about "Hydroton" are answered in a four-page folder offered by Heller Laboratories, Inc., Jersey City, N. J. (63)

TACHOMETERS. Two looseleaf pages for your instrument file describe ¼% accuracy tachometers for making measurements with convenience otherwise unavailable to a continuously indicating switchboard instrument. These instruments, made by Metron Instrument Co., Denver, Colo., have 10 adjoining ranges instantly selectable by a rotary switch. (64)

BATTERIES. Here's a wealth of material on selecting, handling, charging, and maintaining batteries in the mine. Four folders full of information, part of Gould-National Batteries, Inc. (Trenton, N. J.), Plus-Performance Plan, contain reprints, charts and bulletins. The titles are self-explantory:

Charging and Handling	(65)
Selecting Batteries	(66)
Determining Battery Condition	(67)
Battery Maintenance	(68)

TURBINES. Pyle-National Co., Chicago, Ill., has released six bulletins on the company's line of high-efficiency impulse type steam, gas or air turbines for mechanical drive. A bulletin is devoted to each of five types of turbines available, ranging from ¼ to 120 hp., giving performance charts, construction details, dimensions, weights and selection data. The sixth bulletin provides general turbine information. (60)

FLOWMETERS. A lot of help is available to you in the selection and sizing of variable-area meters, in a 40-page handbook just published by Fischer & Porter Co., Hatboro, Pa. (70)

By-Products

NUMBER 59 gets our nomination this month for the most helpful of the free literature For Your Files. This choice will probably get us in trouble though, because of the number of other hot items on the log page.

Number 59 is the first item of its type to hit the NPD pages. Safety men and other supervisors whose work calls for good lines of communication with the miners and mill hands, should find it interesting. We'll keep careful check on the returns from outlying precincts.

MARTINI FANCIERS among mill men probably won't be surprised to learn that there is a new gin on the market which features careful pH control.

ONE FOR THE ROAD. Platonic love is like tip-toeing down the cellar for a bottle of root beer.

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, on reverse side, tear out and mail.

WHAT'S THE PITCH...
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This is a partial report of new laboratory tests to determine the effect of pitch on raking capacity of a classifier spiral. Here, briefly, is what it means to your classifier operation.

When A tons were produced by the 12° spiral 0.86 A tons were produced by the 17½° spiral. When B tons (test No. 2) were produced by the 12° spiral 0.57 B tons were produced by the 17½° spiral.

The pitch angle of your AKINS spiral is 12° with the pitch equal to half the diameter. Increasing this pitch by, say 50%, increases the pitch angle to 17½°. Our tests using pitch angles of 12° and 17½° were run under identical conditions in all other respects. The figures give the story graphically. Test No. 1 was run with material having a high angle of repose. Test No. 2 was run with material having a low angle of repose.

For most applications under normal field conditions, the 12° Akins spiral continues to prove better. As used in the AKINS Classifier, it produces equal or greater tonnage, with lower moisture content in the end product, on less power consumption and with less wear on all parts (based on slippage and abrasion factors).

Be sure you get the raking efficiency your flowsheet demands. Our engineers are qualified to consult on your problem—a service without cost or obligation to you.

Test No. 1 (first set of bar graphs above): Tank slope, 3½ in.; Spiral RPM, 5.71;

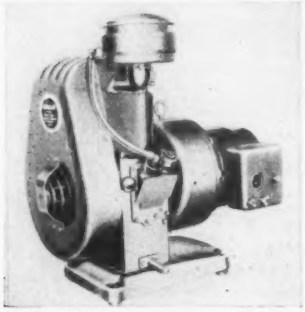
Test No. 2 (last two sets of bar graphs above): Tank slope, 3½ in.; Spiral RPM, 5.71;

COLORADO IRON WORKS COMPANY

Canadian Locomotive Co., Ltd., Kingston, Ont., Can., Head, Wrightson & Co., Ltd., Stockton on Tees, Eng.; John Carruthers & Co., (Pty.) Ltd., Sydney, Aus.; Vancouver Iron Works, Ltd., Vancouver, B. C., Can.; Head, Wrightson & Co., S. A., (Pty.) Ltd., Johannesburg; Edw. J. Nell Co., Manila, P. I.

PHOTOCOPIER. This new Auto-Stat unit enables you to make clear black and white photocopies in less than 30 seconds. Made by American Photocopy Equipment Co., Chicago 14, Ill. No darkroom needed. (15)

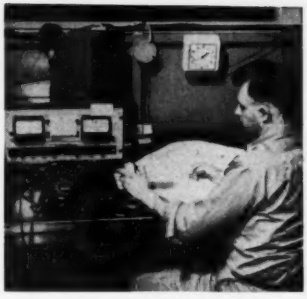
WASHING - SCREENING PLANT. Capacity of this mobile plant runs as high as 30 cu. yd. per hour. It is made by Lippmann Engineering Works, Milwaukee 14, Wis. (16)



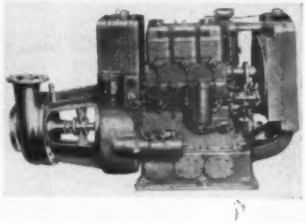
DIESEL-ELECTRIC PLANT. This unit made by D. W. Onan & Sons, Inc., Minneapolis 14, Minn., will produce 3,000 watts at 115 v. and 60 cyc. Costs only $845. (17)

MOTOR CONTROL CENTER. General Electric Co.'s new motor control center is designed for use wherever two or more ac motors (up to 200 hp., 600 v.) are controlled from a central location. Was developed especially for power stations, mills, ore-processing plants, chemical plants and others. (18)

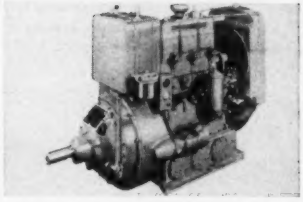
SHORT WAVE RADIO. This short wave radio is used in the Westinghouse Appliance Division plant at Mansfield, Ohio, to dispatch industrial trucks. Operator at left receives instructions from dispatcher who sees to it that units are operated efficiently and without delay in the plant. (19)

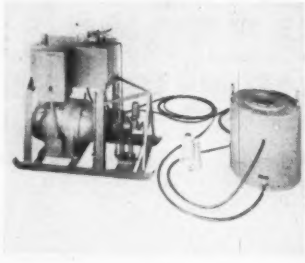


For more information, use convenient reply card opposite page 118



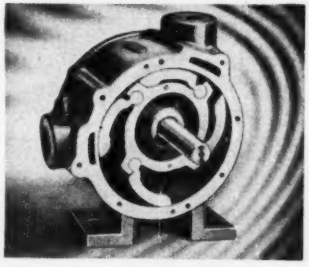
30-45-HP. DIESEL. Nordberg Manufacturing Co., Milwaukee 7, Wis., introduces this new unit rated at 35 to 40 hp. at 1,200 to 1,800 rpm. The engine at left is built into centrifugal pump, and the unit at right is shown with a clutch power take-off for direct connection to a belt drive. (20)



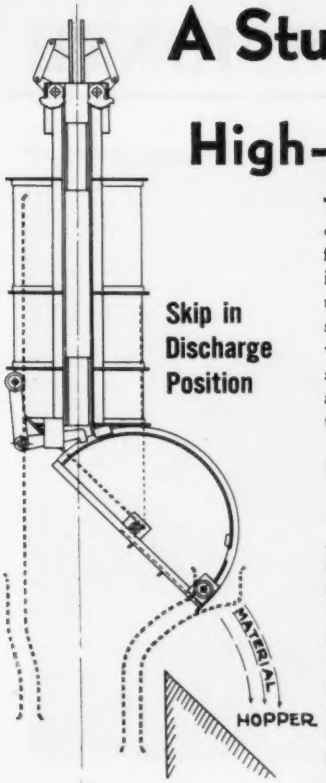


HYDRAULIC JACK. This center-hole puller has a capacity of 600 tons. Operates on 10-hp. motor. Made by Templeton, Kenly & Co., Chicago, Ill. (21)

AIR PUMP. Wing-type pump is designed for both vacuum and pressure work. Made by Leiman Bros., Inc., Newark 5, N. J. Circle No. (22) for more information. (22)



A Sturdy Bottom-Dump Skip
for
High-Speed Balanced Hoisting

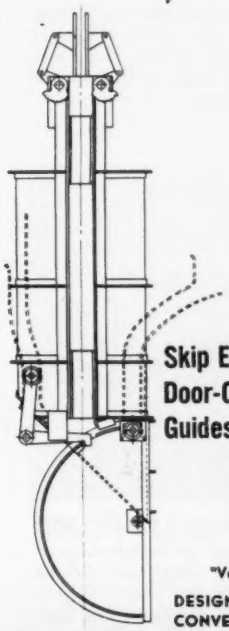


Skip in Discharge Position

The modern 6-metric-ton skip here illustrated is one of several similar units recently furnished for service in a foreign country where reliability is an even more important consideration than usual. Its simple sturdy design and equally simple operation gives all the well-known advantages of bottom-discharge skips, with respect to quick dumping and balanced hoisting, at minimum expense for construction and maintenance of both the skip and the headframe.

Gradual Discharge Minimizes Shock and Breakage

As shown by the accompanying diagrammatic illustrations, dumping is accomplished, without unbalancing the hoist, by means of two sets of "guides" one of which opens the latch as the skip moves into the dumping position while the other swings the door (to the right) so that it becomes an extension of the 45-degree skip bottom and provides an overlapping chute through which the material passes to the hopper without danger of any part of the load falling into the shaft. This gradual opening of the door not only minimizes breakage but also reduces shock to the hopper and its supporting structure.

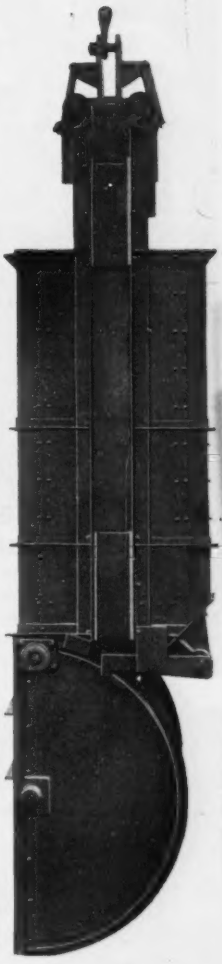


Skip Entering Door-Opening Guides

Alloy-Steel Liners Resist Abrasion and Corrosion

Heavy construction throughout the entire skip, with extra-heavy thimbles, chains and safety devices, assures long service-life but additional resistance to abrasion and corrosion is provided by alloy-steel liner-plates which can easily be replaced.

Many other types of Skips, Cages, and Gunboats are illustrated and described in our 20-page bulletin No. A-457. Write for a free copy if you can use it to advantage.



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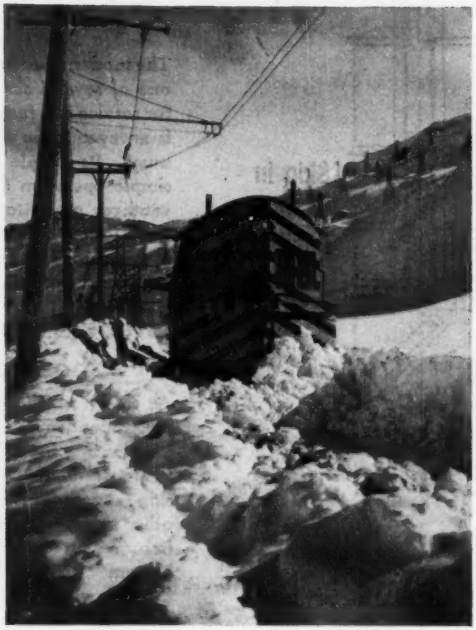
THIS MONTH

SICILIAN SULPHUR MINERS are in good spirits as they return to work after a 60-day strike. With 10,000 miners out and sulphur production crippled, Regional Government of Sicily intervened to stop the strike.



PLOWING OUT is one of winter's big jobs at Kennecott's Bingham Canyon pit: About 100 in. of snow covered upper levels this winter, and there are 160 mi. of standard gage track in the pit and haulage routes.

ASARCO'S NEW LEAD-ZINC MILL at Deming, N.M. was completed in 1950 at 400 tons per day, but had ample room for expansion. It's now up to 750 tons. Editor John Huttl calls it "the neatest thing I've seen for a long time as to design and equipment layout."

NEW GOLD DREDGE RIDES AT ANCHOR at the foot of Tumatumari Falls in British Guiana. With it Colonial Development Corp. and British Guiana Consolidated Goldfields will start an estimated 15 years of production on Lower Pataro. Rate will be 600 to 900 oz. of gold per month.

IN MINING

Zinc Resources of Butte, Montana

Excerpts from a talk by F. A. Linforth, assistant to the vice president, Anaconda Copper Mining Co., Butte, Mont., delivered at 1952 Annual Meeting of American Zinc Institute.

FOR 50 YEARS BUTTE has been known as the "Richest Hill on Earth," but at no time could it be so designated more truly than right now. It is perhaps better known as a great copper mining center. Perhaps, however, somewhat less is known about its vast zinc resources. Perhaps it is not generally known that Montana's zinc mines have for some time ranked second only to those of Idaho in the production of zinc in this country, and most of it came from Butte. At present the production of zinc from its high-grade ores rivals, and even somewhat surpasses, its production of copper.

During the war years beginning in 1942, zinc mining at Butte was suspended at the request of the government so that the limited manpower could be devoted to the production of copper. However, the zinc refineries were operated at capacity on purchased and toll concentrates. By the spring of 1947, with the emergency over, the zinc mining operations were resumed and development work was accelerated in old and new places with marked success until today there are five zinc mines producing ore in addition to the regular production of copper and manganese, and the extensive additional zinc projects which are either under way or planned. There is also a continuing substantial production of zinc as a byproduct from the concentration of the manganese ores.

The present mine production is in the range of 120,000 tons of high-grade zinc ore per month, together with some 85,000 tons of old mine dumps which have accumulated from former zinc mining operations.

The production of slab zinc from ores of the Butte Mines in 1951 showed a 23% increase over 1950.

The total production of zinc from the Butte Mines from its beginning in 1905 through 1951 amounts to approximately 3,700,000,000 lb.

So much for historical data.

Zonal Arrangement

Now in order to visualize Butte's future in zinc, it will be necessary to present some observations on its geologic structure. The district is located in the southern part of the great granite mass which is known as the Boulder Batholith. Locally this granite was invaded by an igneous rock which is believed to have led directly to the deposition of the Butte ores. At any rate, it is found in the center of the Butte Hill just where the great orebodies occur, but is conspicuously absent elsewhere in the batholith. This is the quartz porphyry which seems to have found its way into planes of weakness in the granite and cooled off to form the several quartz porphyry dikes which cross the Butte Hill in an easterly and westerly direction.

The fracture pattern at Butte is traceable to the mountain building forces which are known to have been active to the west. These forces resulted in the formation of a series of east and west fissures, together with many complementary northwest ones which cross the district. It is believed that these fissures became mineralized as a late phase of the intrusion of the quartz porphyry, which had access to the metal-bearing magma where all of the metals—copper, zinc, lead, manganese and silver—are supposed to have been present. It is believed that these metals were all transported in solution from their subterranean sources by means of powerful vapors which rose through the channels then open to them. As they rose, various chemical changes took place by reaction with the wall rock. Also, as they approached the surface and moved farther from the hot source, they became colder. Under these conditions, the metallic minerals which they carried in solution were deposited in the fissures in a well-defined order. The copper minerals were deposited in the fissures nearest to the quartz porphyry dikes where the temperatures were highest. The zinc minerals were formed in fissures in the cooler halo around the central copper zone, and the manganese in the peripheral zone where the temperatures were the lowest.

This is the well-known zonal arrangement of the metals. It is particularly well developed at Butte and explains why the copper, zinc and manganese mines are located where they are. It also provides an excellent guide for the prospecting and development of the desired ore types.

Zinc in Outer Zone

The result of this geologic history is the formation of veins varying from a few inches to 50 ft. or more

Events for Mineral Men

May 22-24, American Society for Quality Control, annual convention. Onandaga County War Memorial, Syracuse, N. Y.

June 23-27, ASTM, 50th anniversary meeting, Hotel Statler, New York, N. Y.

July 1 to Sept. 30, Centennial of Engineering, Chicago, Ill.

Sept. 8-15, International Geologic Congress, annual session, Algiers, Algeria.

Sept. 22-25, American Mining Congress, metal and nonmetallic mining convention and exposition, Denver, Colo.

Sept. 23-25, Institution of Mining and Metallurgy, symposium on mineral dressing, London, England.

Nov. 6-8, New Mexico Mining Association and International Mining Days, Albuquerque, N. M.

Feb. 16-19, AIME, annual meeting, Statler Hotel, Los Angeles, Calif.

Your Guide to "This Month"

122-130. Feature News includes the coming big copper and zinc projects at Butte, Mont.

130-136. The 1951 Annual Reports of major mining companies (abstracted here) are 100% authentic and are fascinating reading too.

136-161. In the United States: The great mineral expansion continues. For instance, Reserve Mining Co. has upped its taconite goals by 50%.

164-167. In Canada: More copper from Quebec.

167-169. In Latin America: Orinoco Mining Co. has ordered several million dollars worth of heavy equipment for Cerro Bolivar.

169-170. In Europe: Sardinia may become a new iron-and-steel center.

170-171. In Africa: Gold mines are scheduled to start producing byproduct uranium soon.

171-172. In Australia: Feverish work in wolfram.

172-173. In the Philippines: Baguio Gold is back.

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in width, averaging in the range of 10 to 12 ft. The ores in the main central area which has the quartz porphyry dike system for its axis are chiefly valuable for copper and contain practically no zinc. Those in the surrounding zone have zinc for the predominating metal with little or no copper, although the transition area contains mixtures of copper and zinc minerals. The outside zone contains practically no copper, only a little zinc, but considerable manganese, much of which forms a valuable ore. All three zones contain some silver, but there is more of it per ton in the outer zones than in the central area. The principal zinc mineral is the sulphide, sphalerite, which occurs both in the form of "black jack" and "rosin jack." It is associated with pyrite and quartz, together with the altered granite, which resulted from the mineralization processes. The grade of the ore may be thought of in the range of 5.5% to 6.0% zinc. Lead in the form of its sulphide, galena, occurs in the zinc ores, increasing from traces at the inside edges to 1.5% to 2.0% toward the upper and outer edges of the zinc zone. This variation also conforms with the zonal arrangement of the metals with respect to their central source.

Thus it will be seen that Butte's zinc ore deposits are contained in a wide area surrounding the central copper zone and extending radially from it in all directions on all levels. In three dimensions the central zone is an elliptical shaped dome. As the veins pass from it into the surrounding ground, they become the loci of zinc mining and development. The volume of this enclosing mass is enormous and the number of veins, large and small, that enter it is legion. The field for exploration is extensive and exceptionally favorable geologically.

Ton for Ton

At this point, the development procedure in the Butte Mines should be explained. Owing to the complex vein structure, together with the extensive faulting that has taken place and the character of the present underground operations, it is wholly impractical to hold open the various underground workings not currently required. It is true that the supply of known ore has always been several years ahead of the rate of production, and this relation is constantly maintained. Development procedure for all types of ore has long succeeded in replacing every ton mined with a new ton, and the tonnage available for mining at the beginning of each year has shown no decline. Geologic evidence is that this situation can continue indefinitely.

Referring now to the historical sketch previously outlined, it will be noted that zinc mining did not actively enter the Butte picture until the production of copper was well advanced. It will also be noted that there have been long periods in which the zinc mines were not operating. Therefore it follows that the future ton-for-ton development of zinc ore starts from a very favorable position both with respect to its time of beginning in the district and also because of the large undeveloped areas in which it can be carried on. This is already exemplified when it is noted that recent ton-for-ton developments in zinc ore have resulted in substantial surpluses in spite of the considerably accelerated rate of production.

Looking further into the future, it is now known that not only can the present five shafts maintain their ton-for-ton, but at least one new shaft can be added. This shaft will be located in a sector of the zinc zone which is relatively undeveloped but which is known to have splendid possibilities. Such a new shaft will not only contribute additional zinc production, but will undoubtedly be able to maintain its own ton-for-ton.

Alice-Lexington Tunnel

Another zinc project, already far advanced, is the Alice-Lexington tunnel. As the name implies, it has for part of its purpose the rejuvenation of the old Alice mine. It is interesting to note that one of the mines, at which the occurrence of zinc was a factor in closing it years ago, now becomes the object of an extensive project which will add substantially to Butte's zinc ore production. This project will also provide improved facilities for operating the Lexington mine which was also an old-timer with a somewhat in-and-out history but which now ranks as a regular producer. These mines are located well on the top of the Butte Hill. The tunnel starts from the railroad grade in the vicinity of the Anselmo mine. Its cross section is 9½ ft. by 8½ ft. inside of timber. Its course is northeasterly for 3,200 ft., at which point it branches 800 ft. easterly to the Lexington and 2,300 ft. northerly to the Alice, most of which is now completed. The haulage system will employ 5-ton cars. They will dump directly into railroad cars.

Low-Grade Zinc Project

Another large project which promises to be even more important in adding to Butte's zinc production concerns the economic possibilities of its low grade resources. Perhaps the development and inauguration of the Greater Butte Copper Project is now pretty well known. It proposes to reenter large mined-out areas and recover, by block-caving methods, some 130-million tons of remnant copper-bearing material too low-grade to have been extracted by conventional methods. The mining of the higher-grade copper ores through many years and the precise geologic mapping has revealed large areas of this low-grade material in and around the larger veins. In the pillars between them, the copper occurs in a multitude

of veinlets and also as impregnations in the altered country rock. These areas also contain large tonnages of old gobs where the larger veins have been mined and filled.

Now the geologic mapping which made this great copper project possible is revealing a similar situation in the larger mined-out zinc areas. Exploration and development of them is now under way, and there is no doubt that there will be a large increase in the future production of zinc at Butte by this means. Present estimates indicate that at least 3,000 tons per day of this type of ore will be hoisted when this project is fully developed.

From the foregoing it will be evident that the future of Butte as a major producer of zinc is exceptionally bright. In view of its recent increases in the rate of production and the favorable ton-for-ton prospects in the five mines now operating and considering the outcome of the zinc projects, now well advanced or planned, it is safe to say that zinc production from the "Richest Hill on Earth" can be practically doubled within the next five years. This forecast is so well assured that the company has already commenced to further enlarge its concentrating facilities.

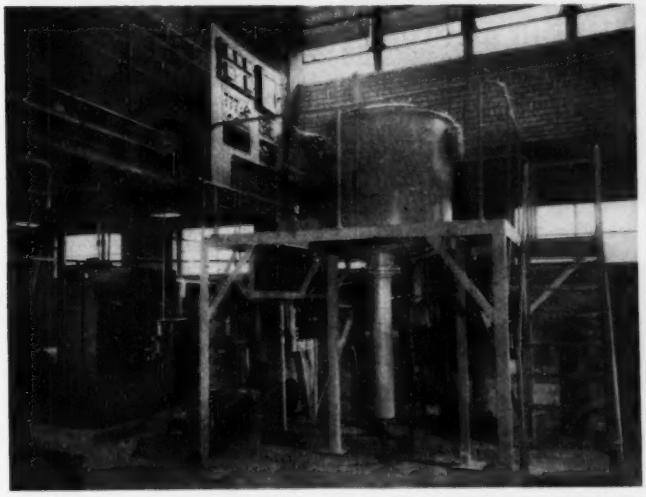
Copper and Manganese

While this is a gratifying prediction with respect to zinc, it is important to note that it detracts nothing from Butte's reputation as a great copper mining center. It may also be said that Butte's production of copper can also be practically doubled within the next five years.

At the same time it must not be overlooked that Butte has long been contributing over 95% of the domestic production of manganese, and can continue to do so indefinitely.

With this combination of circumstances, there is no doubt that Butte is now entering a period of the largest production it has ever had and that zinc will be in the most prominent position.

Note: All predictions are based on the assumption that necessary manpower will be available.



THIS NEW VACUUM MELTING FURNACE is capable of operating at pressures as low as 0.001 mm. of mercury (about 1/1,000,000 of atmospheric).

Greater Supply of Vacuum Metals

THAT FURNACE in the photo above is the first large-scale unit for vacuum melting of metals. It is at the Cambridge, Mass., plant of Vacuum Metals Corp., a wholly owned subsidiary of National Research Corp. Until now, vacuum metals have been available only on a small scale. With the new unit, the company can produce more than 5 tons daily in ingots of 200 lb.

Reason for vacuum melting is to reduce (nearly eliminate) solution of such gases as oxygen, nitrogen, and hydrogen. Copper produced by the vacuum technique has greater ductility, machinability, thermal and chemical conductivity. Reactive metals like titanium, zirconium and molybdenum can be melted without oxidation. Another useful product — vacuum-cast iron — is purer than any obtainable.

In some instances, metals have been boiled at temperatures up to 5,000 deg. F. at pressures as low as 1/100,000 of an atmosphere.

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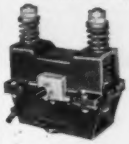

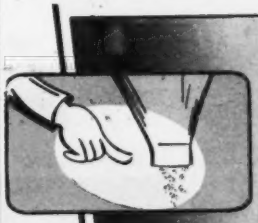

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Israel Plans To Expand Its Mineral Production

RECENT MINERAL DISCOVERIES seem to justify the Bible's description of Israel as a land "whose stones are iron and out of whose hills thou mayest dig copper." Prospectors, take note!

The first surveys were started during the War of Liberation in 1948, almost on the heels of advancing Jewish troops. They were followed by large-scale explorations in 1950. Abraham Dor, veteran geologist and chief engineer of the government-owned Israel Mining Industries, recently declared that "prospecting has now added proof of the existence of potential [mineral] resources which may be of great economic value."

Phosphate rock deposits were located in the Northern Negev in 1950 when Negev Phosphates, Ltd., was founded by Israel Mining Industries and Fertilizers and Chemicals, a private company formed by U. S., South-African, French and Israeli interests. One of the company's plants near Haifa is now producing superphosphates; and when modern equipment arrives, Israel will probably discontinue imports of phosphate. An unofficial source puts phosphate reserves in the area at 100-million tons.

Copper and manganese ore were reported to occur extensively in the region of Wadi Menaiah, 25 klm. north of Eilath. Copper ores are said to occur in sedimentary rocks which outcrop and then dip gradually under increasing thicknesses of waste; from the viewpoint of composition and concentration, the ore would lend itself to easy extraction with high recovery. Estimated manganese reserves are over 2-million tons; ore is described as "fairly satisfactory," but will require mechanical concentration before it can be exported. Israel's manganese requirements in the foreseeable future are small.

Outcrops of iron ore were found in the Makhtesh Hagadol region. They are high-silica ores, but sufficiently favorable to warrant further exploration and study.

Foreign capital will probably be brought into the picture. There is no law regulating the matter, but Israel's first Mining Act (ready for Parliament soon) is understood to provide for possibility of such participation. Among foreign groups now operating, Palestine Economic Corporation of New York is probably the most important prospective investor. That company is now participating in Palestine Potash, Ltd., and Fertilizers and Chemicals, Ltd. The bulk of U. S. investments to date have been channeled through it.

Davis Will Build 250-Ton Zinc Mill in Wisconsin

VERNON C. DAVIS, of Linden, Wis., will build a $190,000 250-ton-per-day mill at his zinc property near Edmund, Wis. He plans to complete it in six months.

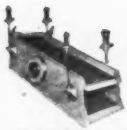
DMPA has agreed to buy his output (equivalent to about 1,500 tons of slab zinc per year) at a floor price of 15½¢ per lb., f.o.b. East St. Louis, Ill., providing he cannot sell to other consumers at a higher price. The purchase agreement terminates three years after start of production, or when the new facilities have produced the equivalent of 3,000 tons of slab zinc—whichever is first.

Iron-Titanium Mine Starts Up in Finland

A special report to *E&MJ* by Dr. Herman Stigzelius, director of Bureau of Mines, Helsinki, Finland.

SINCE THE OTANMAKI iron-titanium deposit was discovered 120 km. southeast of Oulu in 1938, it has undergone thorough exploration, and has been recognized as a paying mining venture. However, lack of capital prevented earlier exploitation. Today the mine is being developed, and a concentrator is expected to start up in the spring of 1953.

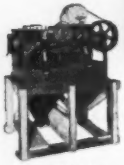
The Otanmaki ore occurs in nearly vertical lenses about 20 m. thick.


Denver-Dillon Vibrating Screens

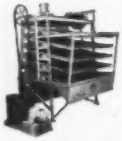
Denver Ore Feeders

Denver Steel-Head Ball Mills

Denver Disc Filters


Denver Selective Mineral Jigs

Denver SRL Pumps


Denver-Buckman Concentrators

Denver Mechanical Gold Pan

DENVER FORCED FEED Jaw Crushers

Sizes:

(Type "H"—anti-friction bumper bearings, bronze side bearings.)

2¼" x 3½"	8" x 10"
3¼" x 4½"	10" x 16"
5" x 6"	10" x 20"

Sizes:

(Type "J"—anti-friction bearing crusher.)

10" x 24"	18" x 36"
10" x 36"	21" x 36"
15" x 24"	21" x 40"
15" x 36"	25" x 40"
18" x 24"	32" x 40"

Specifications: Cast steel or fabricated steel frame. Cast steel bumper. 13%-14% Manganese steel jaws and cheek plates. Forced Feed crushing action. Safety toggle of cast iron protects against tramp iron.

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There are two main groups of orebodies, the Otanmaki, and the Vuorokas; the latter will be held in reserve. It is estimated that reserves in the area total about 50-million tons of ore containing 35% Fe, 12-15% TiO_2, 0.3% V, 0.6% S, and less than 0.003% P.

Crushing and concentrating the ore will be relatively easy. Magnetite and ilmenite particles range in size from 0.1 to 2 mm, and can be separated to produce comparatively high-grade concentrates. On the basis of pilot-plant tests at Otanmaki, it is expected that a full-scale plant will be able to produce iron concentrates running 67% Fe, 2-3% Ti, 0.1% S, and less than 0.002% P. The grade of the ilmenite concentrates is expected to run 45 to 46% TiO_2.

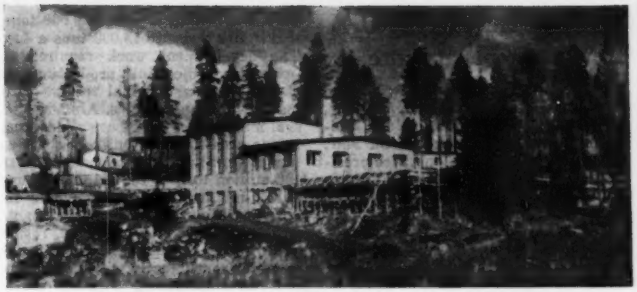
Because of the strength of the ore and wall rock, it is expected that large open stopes will be possible underground. A shaft now being sunk to the 300-m. level will be ready for operation this summer. A large Salzgitter loading machine will be used to load ore into 10-ton Granby-type cars. Electric locomotives will haul the ore to an underground primary crushing plant equipped with "Schlagbrecher" jaw crushers made by Stahlbau Rheinhausen.

Capacity of the concentrator will be about 500,000 tons of ore per year, producing about 175,000 tons of iron concentrates, 75,000 to 100,000 tons of ilmenite concentrates, 5,000 tons of pyrite concentrates, and broken waste and tailings which will be sold for railway construction. The plant is so designed that it can be enlarged to double the above output in the future.

Otanmaki is connected to the harbor at Oulu by a 27-mi. branch railway. The harbor is normally open about eight months per year. Concentrates will be sold abroad.

The investment will be about $7-million, including cost of the surface plant and dwellings for 300 families. Ilmari Harki, is managing director of Otanmaki Oy, and has kindly consented to release this information to *E&MJ*.

THE OTANMAKI mining camp is growing rapidly.



NEW SHOPS and change house, Otanmaki iron-titanium mine.

Denver "Sub-A" Flotation

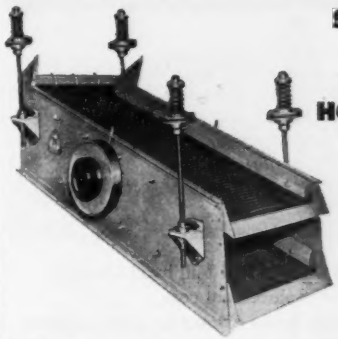
Denver Cross-Flow Classifiers

Denver Hydroclassifiers

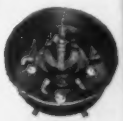
Denver Super-Agitator and Conditioners

DENVER-DILLON Vibrating Screens

SAVE UP TO 50% HORSEPOWER



Denver Reagent Feeders



Denver Pulp Distributor

Denver Thickeners

Denver Jaw Crushers

Notice, on Denver-Dillon Vibrating Screens, that bearings are not anchored to heavy channel iron or other supports. Weight of screen and load is suspended. Bearings support only weight of flywheels and shaft. Screen is free of restrictions to impart maximum vibration to entire screen body.

You save on initial cost, too, for this patented action eliminates unnecessary weight and fabricating costs.

Please write to us about your requirements. Quantity production of standard equipment means lower cost and good deliveries • Complete mill equipment from testing to feeder to dryer.

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McGlone Reveals Big Ore Developments at Butte

THE NEXT FIVE YEARS will see a big increase in output of copper, zinc, and manganese at Butte, Mont. Following is a statement made on Mar. 18, 1952, by E. S. McGlone, vice president in charge of Anaconda Copper Mining Co.'s Western operations:

"I would like to take this opportunity to report on the progress of some of the things we are doing on the hill. The Kelley mine, the result of the Greater Butte project, is now producing ore at the rate of 2,000 tons a day and will increase to 5,000 tons by May, and within a year to 9,000 tons, and in five years to 15,000 tons a day. The development work required to bring this project into production has shown that our original reserve estimates were conservative. Already several million tons have been added, and in one area it is not unlikely that future exploration work will add another 100-million tons to the original figure of 150-million tons. This could in itself, providing the geological department's predictions are realized, result in an entire new project which could be mined concurrently with the Greater Butte project ores.

"The zinc ore developments are equally encouraging. New ore is being developed in the upper levels of the Original mine, the Lexington-Alice tunnel is progressing rapidly and will be completed within a few months, after which large zinc ore reserves in the old Alice and Moulton mines area will be prepared for production. The old Black Rock and Elm Orlu areas are being explored for manganese and zinc, and to date sizable reserves have been disclosed, which, within the next five years, should produce through the Badger mine shaft as much as 3,000 tons of ore per day. Other new areas are developing favorably, and it is now safe to say that within the next five years zinc production from The Richest Hill on Earth can be more than doubled. We are so confident that this can be attained that we have already commenced to further modernize and enlarge our copper, zinc and manganese concentrating facilities at Anaconda at an estimated cost of $4-million. When this program is completed, the Anaconda concentrator will have a capacity to treat in excess of 32,000 tons of ore a day."

Lower Taxes Encourage Turkish Chrome Output

Special report to *E&MJ*
by Orhan Komandit Sirket

DEVELOPMENT AND MINING of Turkish chrome ores by private operators was neglected during the period that the industry was monopolized by the Turkish Government's mining bank, Eti Bank.

But recently with the discontinuation of this preferential treatment, activities of private operations have increased. Railroads and roads are being built extensively, with ECA help, to eliminate transportation bottlenecks. Some harbors are also under construction.

Furthermore in the past those having received a "permit for research" were not allowed to extract more than 2,000 tons. Then they had to apply for a concession, and the difficulty of obtaining one was another cause of delay. For instance some companies having worked under a permit for research were forced to stop mining just when they had found that continued mining would be profitable. Now these restrictions have been lifted, and all that is necessary is an application for a concession. This permits the operator to mine without interruption.

Another serious handicap was the heavy mining tax of 10% for ores extracted from concessions, and 20% for ores extracted under a permit for research. These rates were so high that the Council of Ministers reduced the taxes by decree to 5% repeated for one-year periods in response to pleas made by the Committee of Turkish Chrome Producers.

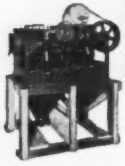
The accompanying graph shows how Turkish chrome production responded markedly to lower taxes.

Denver-Dillon Vibrating Screens

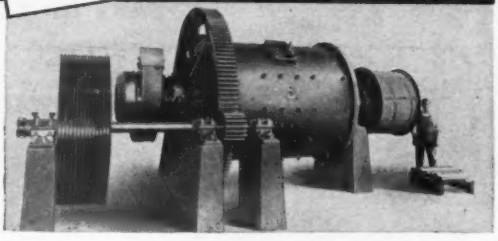
Denver Ore Feeders

Denver Jaw Crushers

Denver Disc Filters


Denver Selective Mineral Jigs

DENVER the Ball Mill with STEEL HEADS



Denver SRL Pumps

What happens when a Ball Mill head breaks?
Mill men know that replacement cost
is small *compared to losses caused by mill shutdown!*

Denver-Buckman Concentrators

Steel heads on DENVER BALL MILLS put *strength* where it is needed. Repeat orders from mills all over the world prove dependability of Denver Steel Head Ball Mills. A Denver Steel Head has never failed!

SIZES: Diameters of 12" - 16" - 24" - 30" - 36" - 48" - 60" and 72" in lengths up to 12 feet.

Please write to us about your requirements. Quantity production of standard DECO equipment means lower cost and good deliveries.

Complete mill equipment from testing...to feeder...to dryer.

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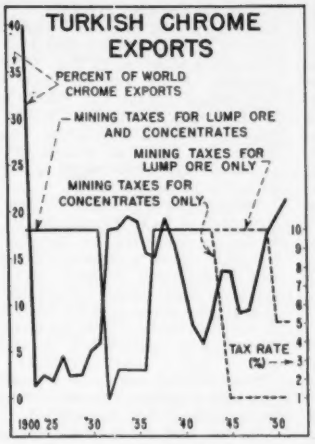

WHEN TAXES GO DOWN, Turkish chrome ore production goes up.

The export of chrome ore for 1951 by producers was as follows:

	Tons
Eti Bank, about	160,000
Türk Maden A.S.	45,254
Orhan Brand ve Sürekâsi Krom Komandit Sti	44,560
Kromit Ltd O (has no own mines)	43,758
Fethiye Sirketi Madeniyesi	26,959
Montan Madencilik T.A.O.	26,331
Maden Arama ve Isletme Ltd.	22,715
Bilgin Maden Ltd. S.	20,078
Sitki Koçman	17,450
Hayri Ogelman	13,169
Stanley Paterson	9,601
Sakir Yorulmaz	8,190
Tefenkrom Ltd. S.	7,820
Anadolu Maden T.A.S.	7,000
Server Somuncuoglu	7,000
Fuat Bulca	5,185
Cemal Hünal	5,000
Yuert Maden Ltd. S.	3,000
Tekirova Madenleri	2,032
Ercument Okten Kol. Sti.	1,758
Ondogu Endustri ve Tecim Ltd.	1,500
Coskun Parker	1,313
and various dealers about	7,000

ECA had granted credits to the following firms: Eti Bank, Orhan Brand ve Sürekâsi, Türk Maden, and Bilgin. Eti Bank and Bilgin were the only two to take advantage of the credits. The other two firms declined because they were able to obtain mining equipment at lower prices from Sweden and Germany than from the United States.

Bank credit is very difficult to obtain in Turkey at present. However, some mining firms have plenty of funds, and some are getting advance payments from firms abroad on ores to be delivered.

Eti Bank produces the best metallurgical grade ores. Orhan Brand ve Sürekâsi produces some of the best known refractory grade ores, and production is sold up to 1956. The latter is a Swedish-owned firm holding many large concessions. It operates its own assay laboratory and exploration department. The company's Basoren mines are famed for their modern installations.

Christmas and Banner Get Floor Price on Copper

SAM KNIGHT MINING LEASE, INC., of Winkelman, Ariz., has negotiated an over-the-ceiling price agreement with DMPA. The two-year contract provides that Christmas mine will continue to produce at its current rate (equivalent to 1,195,000 lb. of electrolytic per year). DMPA's guaranteed price is 31.6¢ per lb.

Banner Mining Co., of Tucson, Ariz., has negotiated a similar agreement which calls for 30.53¢ per lb. on two years' production of the Miser's Chest mine near Lordsburg, N. M. It calls for 5,438,000 lb. during life of the contract.

Though both agreements run for two years, they may be cancelled on 60 days' notice by either party, and terminate automatically in the event copper is removed from price controls.

These are the third and fourth such agreements on copper. Altogether, the

Denver "Sub-A" Flotation

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DENVER Mineral Jigs

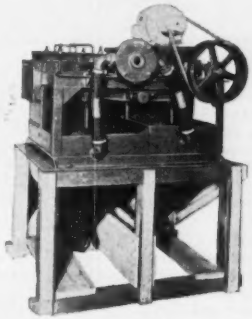
Recover Your Minerals as soon as Free

Denver Reagent Feeders

Gravity concentration *in grinding circuits* is now possible. Denver Selective Mineral Jigs treat an unclassified feed and recover minerals as soon as free and at a coarse size.

Prove to yourself the advantages of recovering mineral as soon as free *and before you grind H---* out of it! Send a 100 pound sample of ball-mill feed and $30.00 to: Denver Ore Testing Laboratory, Denver 17, Colorado. Please sketch present flowsheet and give tonnage. Products of Denver Jig Test will be returned to you for assay. If you are not satisfied there will be no charge. You are the judge.

Tests of this nature have discovered amazing recoveries that reduced over-all milling costs.



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A WELL-KNOWN Idaho mine is emptying the ore cars shown herewith in 10 seconds flat. It is doing so with the help of a CLEVELAND Type LSRR air vibrator. With this vibrator the ore is emptied without any bumping with a lomocotive. Dumping time is reduced to one-third to one-tenth of that required before the vibrator was installed.

One man handles the complete operation.

It's a simple operation: The vibrator is permanently installed on an air line along side the track over the ore pocket. Each car on the level has a female bracket welded on the sloping side of the car. As a car is pulled over the pocket, the dump is tripped and the vibrator slipped into the bracket. Air is turned on with a hand valve, the car is emptied, and the vibrator is lifted from the bracket.

The CLEVELAND Type LSRR is being widely used on other materials handling equipment, such as bins, hoppers, chutes and flasks. Its intensity of vibration can be varied at will, to either gently persuade the material or deliver heavy, hammer-like blows.

What's Your Problem?

We have a complete line of air vibration equipment.

THE CLEVELAND VIBRATOR COMPANY

2835 Clinton Ave. • Cleveland 13, Ohio

This Month in Mining *(Continued)*

four cover production of seven mines which will produce about 33-million lb. during life of the contracts. The price per lb. was determined in each instance from cost of production. All agreements cover high-cost producers, and are a follow-through on Jess Larson's statement of December, 1951 that DMPA would sustain production from such mines rather than let them close down because they couldn't operate at the ceiling price.

New Iron Ore Deposits in Zamboanga Promising

PRELIMINARY EXPLORATION of two deposits in the Lake Wood and Pagadian areas, Zamboanga Province, P. I., indicates 110,000 tons of 60 to 65% iron ore in sight. It is hard, massive magnetite, low in phosphorus and sulphur.

Conacon-Jobilan deposit, 7 klm. north-northwest of Lake Wood, consists of 31 claims with a length of 2.1 klm. and a width of 1.5 klm. A rough estimate of ore available from one lens-shaped outcrop and visible float is 40,000 tons of 60% iron. Some float boulders measure 10 m. across. Ore in place is in irregular masses on the top of a ridge which seems to be the upthrown block of a fault.

Baluk-Bahan deposit, 15 klm. north-northeast of Lake Wood, consists of 56 claims measuring 2.4 klm. by 2.1 klm. It is also on a ridge-top. The outcrop is lenticular in form, and the visible portion contains about 55,000 tons of ore as good or better than that at Conacon-Jobilan. Ore recoverable from float is calculated to be 15,000 tons.

These results are from a preliminary survey made by Bureau of Mines' geologist Ignacio S. Antonio.

Elizalde and Co. is developing and further exploring the deposits.

Your Digest of Annual Reports

Production, Profits, Developments, Trends from the Reports of Major Mining Companies

AMERICAN SMELTING & REFINING CO. sold $530.8-million in products and services for a net income of $39.7-million. Gross was up and net was down. Production of refineries was, excepting zinc, lower than in 1950, although the company had 955 more refinery employees:

	1950	1951
Gold, oz.	1,342,431	1,196,096
Silver, oz. ..	78,270,405	72,370,258
Lead, tons ..	578,527	503,851
Copper, tons .	474,671	414,226
Zinc, tons ..	145,920	149,231
Ore Mined, tons	2,460,759	2,453,018

A new zinc-fuming plant at Chihuahua, Mex., is under construction. It will have an annual capacity of 23,000 tons of zinc in fume, and is to be in operation in the third quarter of 1952.

At Selby, Calif., a similar zinc-fuming plant was started late in 1951. It will have a capacity of 10,000 tons of zinc in fume, and is scheduled for completion about Jan. 1, 1953.

Highest stack in the world is the one ASARCO completed at El Paso, Tex. It is 611 ft. high, a few feet higher than at Selby. Main purpose of the height was to minimize effects of smelter gases.

At Garfield, Utah, Garfield Chemical & Manufacturing Co. (half ASARCO's, half Kennecott's) completed a new 250-ton-per-day sulphuric acid unit. Another proposed unit would bring capacity to 750 tons.

Silver Bell unit, the new Arizona pit, will be operating early in 1954 if equipment is available. Stripping began in December 1951. The orebody contains 32-million tons of approximately 0.9% copper.

Van Stone Mine, Washington, is scheduled to produce 30,000 tons of low-grade zinc-lead ore per month. It will start production in the third quarter of 1952.

Buchans Mining Co., Ltd., in Newfoundland, completed its Rothermere shaft to a depth of 2,513 ft., and continued underground development from the shaft. Results indicate that a greater tonnage of ore will be mined than was indicated by surface diamond drilling.

In Mexico, ASARCO started construction of a mine surface plant, mill, power plant and townsite to put the Nuestra Senora lead-zinc-silver property in production. Rate will be 12,000 tons of ore monthly. Operations will begin in late 1953.

Exploration and development of the Rosario lead-zinc-silver property at Rosario, Sinaloa, was continued with encouraging results.

A fluorspar deposit at Encantada, Coahuila (about 70 mi. south of the Rio Grande) was optioned; it is now being studied with a view to commencing plant construction in the second half of 1952.

In southern Peru, ASARCO had nearly drilled out the Toquepala cop-

per porphyry at the end of 1951. A little more drilling is necessary to delimit the deposit. Tentative results indicate a large economic deposit that can be open-pitted. No further work was done on the nearby Quellaveco copper deposit. Decision to develop either Toquepala or Quellaveco now pends on an investigation of possible power, railroad, and port facilities.

Inland from Pacasmayo, Peru, the company is developing a good-grade lead-zinc-silver property for production at the rate of 7,000 tons of ore per month. Operations are scheduled to begin before you read this. Here, ASARCO's report says "encouraged by the provisions of the new Peruvian Mining Code . . ."

In western Australia, the Protheroe Mine, owned by the Anglo-Westralian Mining Pty. Ltd. which is controlled by ASARCO, was placed on full-scale production; it is a small high-grade lead mine. Operations at the company's Horseshoe gold mine are scheduled to have started by now.

THE BERYLLIUM CORP. On net sales of $7.7-million, the company showed a net profit of $0.7-million. Important beryllium alloys produced were those of copper, nickel, aluminum and magnesium. A new low-beryllium copper alloy opens the field for broader industrial use. A new high beryllium-aluminum alloy was introduced. The plant was improved for recovery of beryllium wastes. In raw materials, the company is now exploring the possibilities of developing its own sources; major interests are in Brazil, where the company is examining the prospects of mining for beryl and accompaying minerals.

CALLAHAN ZINC-LEAD CO. owns 63% of Vulcan Silver-Lead Corp. whose properties are in Idaho. American Smelting has leased the Vulcan holdings for 30 years under an agreement to pay 10% of net smelter or mill returns until ASARCO's capital investment has been returned and a $500,000 working capital has been set up. After that time, ASARCO will pay Vulcan 50% of the net. ASARCO concentrated its 1951 efforts on improvement and enlargement of the shaft, and at the end of 1951 had spent a total of about $1.9-million on the project. Resumption of deep development work on an expanded scale is expected before mid-1952.

At the Akron unit, in Colorado, work is progressing on a DMA-company exploration project.

CALUMET & HECLA CONSOLIDATED COPPER CO. had a total income of $44.6-million, down slightly from 1950, for a net gain of $5.0-million, down from $7.4-million in 1950.

In Michigan, the company operated its seven copper mines and two tailing reclamation plants throughout the year; grade of all was low:

(*Continued on page 132*)

TOUGH PORTABLE CABLE FOR **EFFICIENT** TRANSMISSION OF **HIGH** VOLTAGE

Collyer Type SH-D Cables with grounding-conductors. Each conductor has shield over insulation.

We will be glad to send samples and recommendations. Write Collyer Insulated Wire Co., 245 Roosevelt Ave., Pawtucket, R. I.

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PILOT PLANT

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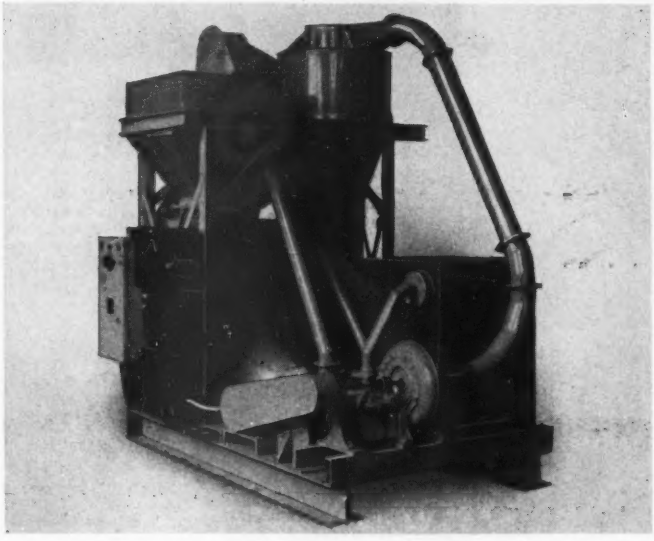
"PACKAGED" DRY GRINDING SYSTEM



This self-contained Hardinge Dry Grinding Unit is ideal for pilot plant or laboratory application. It contains a Hardinge Constant Weight Feeder, Conical Mill, Air Classifier, dust collector, product collector, and "Electric Ear"® grinding control. The unit stands only 8-feet high and occupies 7' 7" x 5' 2" of floor space. It needs only a power connection to start operating. Details in Bulletin AH-373-1.

See Opposite Page for Branch Offices

HARDINGE

Digest of Reports *(Continued)*

	Tons Treated	Lb. Copper	Lb. Per Ton
Mines	2,007,538	37,597,427	18.73
Tamarack recl.	885,400	2,921,021	3.30
Lake Linden recl.	332,200	2,479,331	7.46
Total primary	3,225,138	42,997,779	—
Secondary & Toll	31,139	21,687,334	—
Total Production	—	64,685,113	

Exploration was continued on an expanded scale. A DMA-company exploration involves $568,193 for exploration of the Kearsarge Lode. In Ontonagon County, the company is exploring the Knowlton Lode without government aid.

At Shullsburg, Wis., the company's zinc mine was placed on a production basis at the beginning of 1951. It produced 13,286 tons of zinc concentrates and 869 tons of lead concentrates. Reserves at year's end were greater than at the beginning of 1951.

CHIEF CONSOLIDATED MINING CO., from its operations at Eureka, Utah, had a 1951 income of $1.3-million for a net operating loss of $0.27-million.

Total Production
Chief & Plutus Cos.

	1950	1951
Gold, Oz.	3,602	2,999
Silver, Oz.	959,885	723,630
Lead, Lb.	17,164,096	12,184,844
Copper, Lb.	77,713	104,534
Zinc, Lb.	16,763,732	8,425,910
Ore, Tons	169,474	125,318

Until August, production at the Chief shaft was limited to upper levels; after August, with the completion of a new electrical-and-pump system on the 2300, production rose rapidly. An 11,000-gpm system was installed on the 2700 level. Now, the 18-411 winze is being sunk 400 ft to the 3100 level; a new hoist has been ordered for the winze; and development of the 2600 and 2700 levels (in better ore than last year) is being pushed.

CONIAGAS MINES, LTD. reports that Rankin Inlet Nickel Mines Ltd. (7.8% owned by Coniagas) carried on an active drilling campaign and a geophysical survey during the summer months at its properties near Hudson Bay. "An excellent tonnage of nickel-copper ore of good grade has been disclosed and it is proposed during the forthcoming season to further extend the work . . ."

CONSOLIDATED COPPERMINES CORP. continued its operation at the Morris-Brooks pit during 1951, and continued to sell and salvage underground equipment from its discontinued operations near Ely, Nev. The company sold its Minnesota claim, adjoining Kennecott's Deep Ruth mine, to Kennecott Copper Corp. for a sum of $350,000. The Minnesota

contains about 2-million tons of commercial ore.

THE EAGLE-PICHER CO. Net sales were up to $82.1-million for $9.5-million net profit in 1951, as against $69.1-million for $6.4-million profit in 1950. Included in the company's list of products for sale are lead, zinc, tin, and insulating products. Also germanium, germanium oxide, cadmium and gallium.

FROBISHER LTD. concentrated its development efforts on the Kilembe Mine in Uganda, Africa.

Kilembe's reserves, as per a report by Ira B. Joralemon dated May 4, 1951, are 14,054,000 tons averaging 1.98% copper, and 0.154% cobalt (developed, probable, and inferred ore). Actual reserves may be more than double that amount. Plans and estimates were prepared for mining, and production of refined copper and cobalt concentrates.

New Calumet Mines Ltd. milled 1.6-million tons of ore during the year ending Sept. 30, 1951, and produced concentrates containing 199.6-million lb. of zinc, 57.3-million lb. of lead, 4.5-million oz. of silver, and 22,880 oz. of gold.

United Keno Hill Mines Ltd., Yukon Territory, continued its high-grade silver production. It milled 239,538 tons and produced concentrates containing 13.4-million oz. of silver, 50.7-million lb. of lead, 22.0-million lb. of zinc, and 23,000 lb. of cadmium. Reserves as of Dec. 31, 1950 were 328,530 tons containing 46.4 oz. of silver and 8.6% lead, of which 85.7% were at the Hector mine.

Mediterranean Mines Inc. in Aug., 1951, started production of zinc and lead concentrates at its newly completed mill.

At Zeballos Iron, on Vancouver Island, B. C., substantial quantities of good quality magnetite are indicated. Drilling to date indicates 632,000 tons averaging 58.8%. Drilling will be resumed in the spring, and plans are being made for development and production with underground working starting in the summer of 1952.

HOMESTAKE MINING CO. grossed $16.9-million for a net income before depletion of $4.5-million. In 1951, the company produced 1.0-million tons of ore, recovering 96.79% or $14.80 per ton. That compares with 1950's 1.3-million tons for a 97.03% recovery of $15.23 per ton.

Remodeling of the Yates crusher plant—with a third stage of crushing—was completed. The Ross crusher was scheduled for similar remodeling to have been completed in Mar., 1952. The South Mill's grinding section is being changed for elimination of stamps and resulting economies of operation.

Changes in drilling equipment and

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PILOT PLANT

THEN INVESTIGATE

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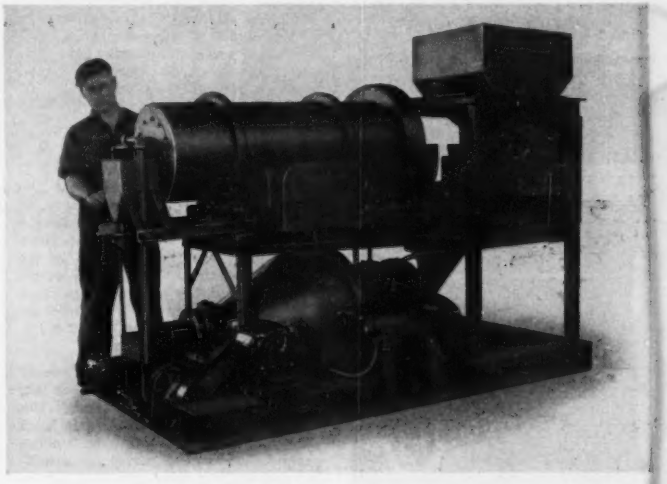
"PACKAGED" WET GRINDING SYSTEM



For pilot plant or laboratory applications requiring wet grinding and classification, Hardinge's completely self-contained wet grinding system makes the ideal unit. The unit includes Hardinge Conical Mill, Counter-Current Classifier, Constant Weight Feeder with "Electric Ear"(R) grinding control, launders, and pump. The unit is ready to operate as soon as power and water connections are made. The unit is portable, 6' 8" high, and occupies a floor space of 8' 6" x 4' 2".

Get complete details in Bulletin AH-373-1.

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Digest of Reports *(Continued)*

practice are being made as rapidly as possible. These changes are the result of studies made during the last several years, and will result in production economies.

KENNECOTT COPPER CORP. grossed $455.5-million for a net income of $91.3-million. Total production (from the five divisions) was higher than 1950 in all but gold and silver:

	1950	1951
Ore mined, tons..	55,017,828	56,168,495
Copper, lb.	1,152,065,960	1,202,856,900
Molybdenite, lb...	29,407,143	30,837,157
Gold, oz.	450,174	430,515
Silver, oz.	3,586,763	3,441,549
Zinc, lb.	5,413,875	17,409,950

The company's U. S. production of copper increased 24-million lb., or about two-thirds of the total domestic increase.

Utah Copper Div., Kennecott, extended the Lark-Bingham tunnel to its final length of 21,300 ft. for U.S. Smelting; underground work was 80% complete, surface work 40%.

Chino Mines Div. produced 7.8-million tons of ore. The new Oswaldo No. 2 shaft (an underground zinc operation near the Santa Rita pit) began operation in Mar., 1952. Oswaldo produced 17.4-million lb. of zinc, more than three times its 1950 production.

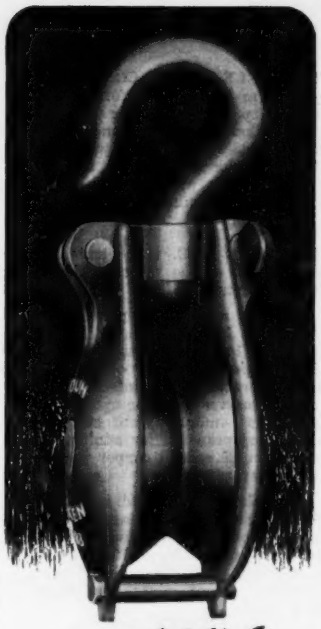
Nevada Mines Div. produced 3.9-million tons of ore compared to 5.1-million in 1950. Preparations at the Kimbley orebody (open-pit) were on schedule, and production is expected about the middle of 1953. The Deep Ruth shaft was sunk to 18% of its ultimate depth. "Veteran," a small orebody about 1½ mi. from the main pit, is being prepared for open-pit production; it averages about 0.9% copper.

Ray Mines Div., producing nearly twice as much ore from the truck pit, hit an all-time high in output. Of the 4.2-million tons, 3.0-million came from the pit, and 1.2-million from underground. Increased capacity for crushing and milling were provided before the end of 1951. Conversion largely to pit operation is cutting costs and increasing output.

Chilean Div. also hit a record, with 9.8-million tons of 2.11% ore—versus 8.4-million tons of 2.09% in 1950. At the mine, substantial economies have resulted from a change-over to modified sublevel caving. Production of molybdenite was up 74%—Reasons: higher-grade ore; more ore; and remodeling of the molybdenite plant completed in 1950.

Quebec Iron & Titanium (two-thirds owned by Kennecott) produced 342,000 long tons of ilmenite ore; 332,000 went to the refinery at Sorel. At Sorel, two furnaces are complete, one nearly complete; two more are expected to be completed this year.

(Continued on page 136)



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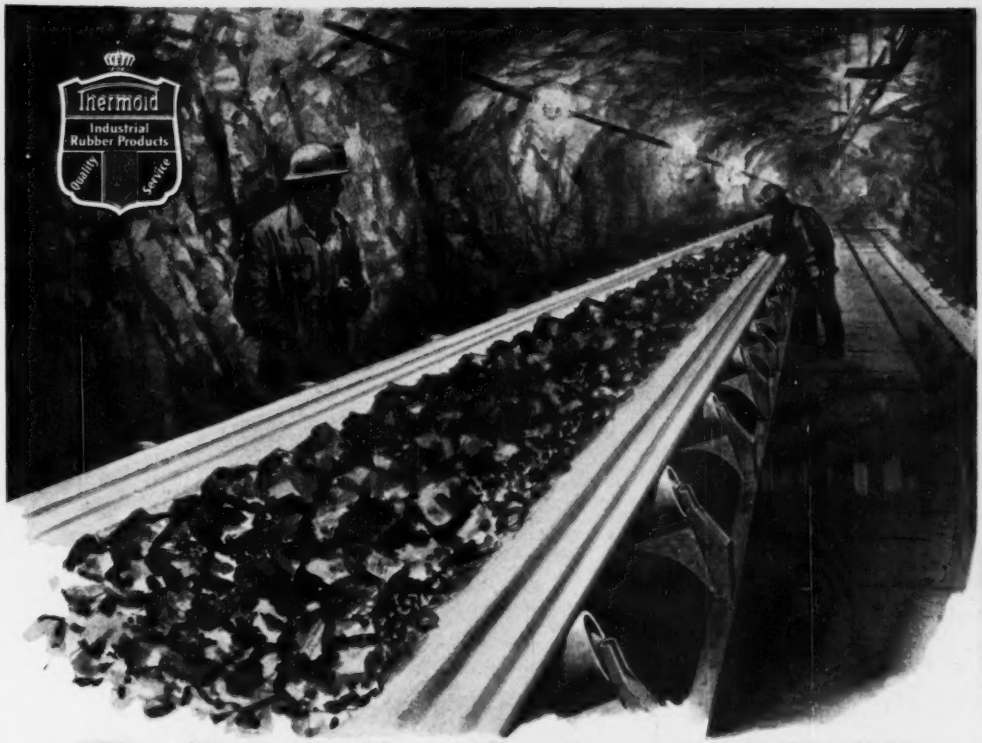

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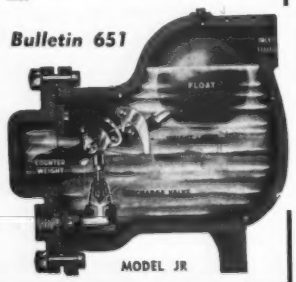

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Digest of Reports *(Continued)*

Orange Free State, South Africa. At the Virginia three shafts are being developed, and at the Merriespruit, two. The shallow shaft at Virginia has been completed to 1,800 ft. The other four are in progress. Mill construction has been started.

Exploration. ". . . the industry must turn to modern scientific procedures . . . your company's exploration department has been expanded and strengthened during the past year. New techniques in geology and in prospecting methods are being studied. Your management is making every effort, in the three of the four quarters of the globe where exploration is possible, to find and develop new mines."

Titanium Metal. "Your company has had several processes under investigation during the past years. One of these processes has demonstrated, on a laboratory scale, the possibility of producing superior quality metal, with certain production advantages over the present process. A pilot plant to evaluate the process on a scale of about 200 lb. per day is under construction at Battelle Memorial Institute and is expected to be in operation around the middle of 1952."

Recovery. "A research project, undertaken early in the year, demonstrated that a very appreciable improvement in molybdenite and copper recovery can be achieved. It is expected that the benefits from this project will be realized beginning in the latter part of 1952."

KING ISLAND SCHEELITE, Australia, reports that its year ending Oct. 31, 1951 was far the biggest yet:

	1950	1951
Tons milled, dry	152,508	155,596
Head value	0.54%	0.55%
Conc. sale, tons	776.07	973.06
Conc. Grade	67.0%	61.6%
Realized Value, million	0.5	1.8

A new Vanner Retreatment Section was finished in May, 1951, and produced 8,053 units in a 48.8% concentrate. Two old 5-ton trucks were discarded and replaced with two 15-ton diesels which will be the nucleus of a new fleet of 12 diesels. The machine shop was doubled and a garage built to house eight Euclid trucks.

IN THE UNITED STATES

ALASKA

★ **U. S. Smelting,** Refining & Mining Co. will operate five dredges in the Fairbanks area and four dredges in the Nome area, according to James Crawford, manager of the F. E. Co. which will employ about 500 men at the peak production period. During March ice cutting was begun at No. 2 on Fairbanks Creek, No. 6 on Gold Hill and No. 10 on Cripple Creek. The dredge at Eldorado Creek and the one on Engineer Creek will start later.

Each year, U. S. Smelting is offering three years of summer employment followed by a $250 scholarship to the University of Alaska to six high school and university students, according to Earl Beistline, dean of the School of Mines. Applicants must be over 18 years, must either be enrolled or intending to enroll in mining, metallurgical, civil or other engineering courses at the university.

ARIZONA

★ **Manganese explorations** have been stepped up in Arizona with research to mid-March showing five properties in the Winkelman district (Pinal County in Central Arizona) capable of profitable operation.

Tests at the Salt Lake Experiment Station indicate three of the Pinal properties have ore which can be readily concentrated to high-grade products with good recoveries; two require complex and costly treatment because of close association with iron.

The properties listed as potentially profitable include Geronimo claims, 46-49% product with recoveries of 76-90%; Benningfield properties, 46.5-54% and 59-84% recoveries; North Star Claims, 48% with 63-96% recoveries; and Orson Branch Claim, assays to plus 48% and recoveries 63-96%.

★ **From Artillery Peak** more than 2,500 tons of manganese ore have been mined and hauled to stockpile at Boulder City where a pilot plant is testing recovery methods.

★ **Tungsten operations** on Carr Canyon claims in the Huachucha Mountains of Cochise County have been resumed by Mineral Development Corp., Dallas, Texas. The company is building a mill to handle 200 daily tons of ore. Its mine was worked during World War 1 and from 1935 to 1941.

★ **Development of new** copper orebodies to replace depleted properties should add 137,000 tons to present production of 417,000 tons annually, according to Roger Manning, director of the State Department of Minerals and Resources.

In 1951 copper production by districts was as follows: 144,300 tons;

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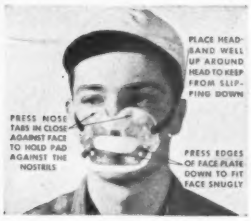
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Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

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Arizona *(Continued)*

Globe (Inspiration-Miami), 90,500; Ajo, 61,725; Mineral Creek (Ray), 50,600; Warren (Bisbee), 29,250; Pioneer (Superior), 17,800; Verde (Jerome), 9,500; and Eureka (Bagdad), 9,150.

CALIFORNIA

★ **Expansion** at the El Rey quicksilver mine in the Panoche Valley area near Hollister has included installation of a jaw crusher, a rotary furnace capable of treating 25 tons of cinnabar daily, and a condensing system. The lower tunnel was extended 150 ft. last year.

★ **At the Leviathan** sulphur property, about 30 mi. west of Yerington, Nev., Anaconda Copper Mining Co. is scheduled to begin operations. C. V. Isbell Co., Reno, will strip the deposit.

Sulphur from Leviathan will be trucked to Yerington where Anaconda will produce sulphuric acid for treatment of its oxide copper ore. Anaconda conducted extensive exploration and development work before purchase of the property and plans to begin operations as soon as a projected access road is completed. The Leviathan was worked during World War I and later in 1948 by the Siskon Mining Corp., subsidiary of Texas Gulf Sulphur Co.

★A dragline dredge, moved from a Mariposa County placer property to what was once the bed of Big Creek, 14 mi. from Chico, is now handling 450 cu yd. an hour. It was installed by C. H. Thurman and A. J. Wright. It is working to a depth of about 15 ft. (bedrock), digging a pond 400 ft wide. An extensive deposit of gold gravel is said to be available.

★Idaho-Maryland Mines Corp., one of California's foremost lode gold producers, reports a profit of $6,820 for the first half of 1951 as against a loss of $107,341 for a similar period in 1950. Ore milled during the first six months of 1951 averaged $12.7 a ton compared with 1950's $9.38 a ton.

Company's ore production has been increased by use of new lightweight drills and enlarged workings in deep levels of the Idaho mine. Development of virgin ore zone discovered between the 2,300-ft. level in the Idaho mine and bottom of the 3,280-ft. Brunswick shaft is progressing rapidly. General Manager Albert Crase expects that the new orebodies should assure 15 to 20 years of productive operations.

★A series of quick-succession snow-avalanches caused by vicious Alaskan storms took a disastrous toll in mid-March in the Sierra-Nevada near Bishop, Inyo County; caused heavy damage at the U. S. Vanadium Co.'s mill; wiped out the Tungstar tungsten mill a mile away; killed two workers on the City of Los Angeles George Power Project; and marooned hundreds of persons in the rugged mountain areas.

At the U. S. Vanadium Mill 15-month-old Mike Holmes, son of Tom Holmes, mine superintendent, was buried under 18 ft. of snow and debris when an avalanche destroyed the Holmes house. Rescue workers found the boy two hours later unharmed and kept warm by two pet dachhunds. Heavy snow also isolated 31 Vanadium night shift workers in the mill for 24 hours before they were dug out.

The same avalanche which demolished company homes tore out a power substation, a terminal for the tram conveyor, and crashed into Vanadium's mill.

★ **Horace Underwood**, Hollister mining man, reports that he has found two large nickel deposits in the southern part of San Benito County. They vary in width from 107 to 250 ft., and also carry chromite, some cobalt, and a little gold.

COLORADO

★**Trail Mines, Inc.**, a newly organized Cripple Creek corporation, has started work on the Trail vein from the 14th level of Cresson Mine. Present plans are to drive at least 1000 ft. along the Trail vein through four basalt dikes and other mineralized crossings. Basalt dikes in the line of drive are the Silver, Anna Lee, Dexter and Blue Bird. Trail, although working through the Cresson shaft, will be leasing on a royalty basis from United Gold Mines. Properties leased include the Trail, Big Banta and parts of the Rose Nicol and Portland.

★**Extensive diamond drilling** at the old mining camp of Vulcan, southwest of Gunnison may bring a revival of mining. "We are using three shifts daily for seven days a week core-drilling in the area around Vulcan," said John Green of Newmont Exploration, Ltd., Jerome, Ariz. "Our company is interested in the value and extent of several minerals to be found in that vicinty but I have not yet received assay reports." A half-dozen holes have been cored, one extending down 800 ft., and on the results of the cores being tested at Leadville, Newmont officials at Jerome will decide whether or not the mines will be reopened, Green explained.

★**Malachite copper mine**, up in the Genessee mountain area west of Denver, is active again. Two carloads of ore have been shipped to Garfield, Utah, and two more cars have been loaded at Golden, the nearest railroad station.

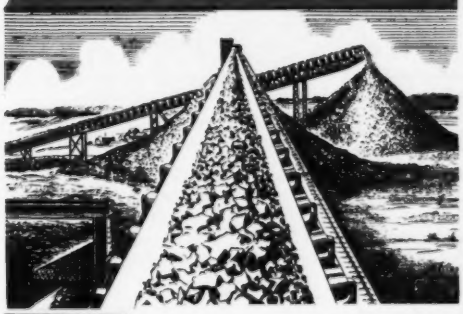
★**Development work** in the famous Custer County mining region may return prosperity to that area, made famous by ore discoveries and production from the Bassick, Bull Domingo and other rich mines of early days. Newmont Mining, Ltd., of Clarkdale,

This new

CONVEYOR BELT

gives you everything you want . . .

RAY-MAN "F" CONVEYOR BELT



Users asked for a conveyor belt to stand up where there is exceptional tendency to tearing or puncturing . . . where pulleys are relatively small . . . and yet where only a thick, narrow belt could be used. It must hold fasteners better too. R/M engineers solved this combination of tough problems with Ray-Man "F", the new conveyor belt using unique properties of synthetic fibre strength members • Ray-Man "F" also gives you everything you ask for in a general purpose belt — troughability, flexibility, resilience for shock loading, better cover adhesion. It naturally follows that you get longer service than you ever thought possible in a conveyor belt • Bulletin 6915 describes it fully. Write for your copy . . . The R/M representative can show you equally good engineering in R/M hose, transmission and V-belts.

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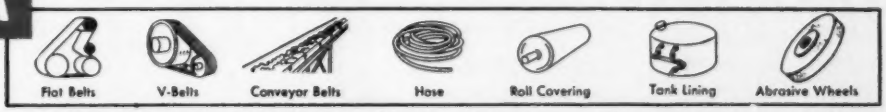

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Colorado *(Continued)*

Ariz., is now in the midst of a series of diamond-drill tests about two mi. north of Westcliffe. The company is reportedly searching for silver, lead, copper and zinc. Several miles to the east, in the vicinity of Risita and Querida, USBM is reported to be drilling for uranium.

★**Eastern interests** are going over the Stanley mine just beyond Idaho Springs in Clear Creek County and engineers are preparing data on the past and probable future production. The Stanley, in its heyday, was a good producer. Using stamps which are still set up in the mill, former operators recovered some $3-million.

★**Boulder Tungsten Mines, Inc.** was organized to operate tungsten mines located in the Sugar Loaf mining district of Boulder County. The company is under the direction of George H. Teal of Boulder. David Taylor of New York is vice president. The Marion mill, on the east end of the properties, was also acquired by the company and is being remodeled to handle at least 50 tons of custom tungsten per day, and also the company's own production. Boulder is installing new equipment to make the plant one of the finest in the district. Thomas S. Bailey, who has had a number of years experience in treating tungsten and other complex ores, is metallurgist and mill superintendent.

★**Gold Coin** Mining and Leasing Co. announces the start of operations on a lease block tributary to the Ajax shaft of the Golden Cycle Corp. First work is being done on the 12th level of the Ajax on both the Newmarket and Dorothy veins. Gold Coin's leases extend from surface to the 21st level of the Ajax shaft, and the company plans an early start for work on the 20th level. The Gold Coin lease is a split-check contract with the Golden Cycle. Ben F. Hill, Cripple Creek mining engineer, is president of Gold Coin.

★**La Salle Mining Co.** is operating its uranium-vanadium mines in western Montrose County at capacity, according to Matthew P. Rowe, general manager. All ore is shipped to the USV's Uravan plant. Jess Allen is mine foreman.

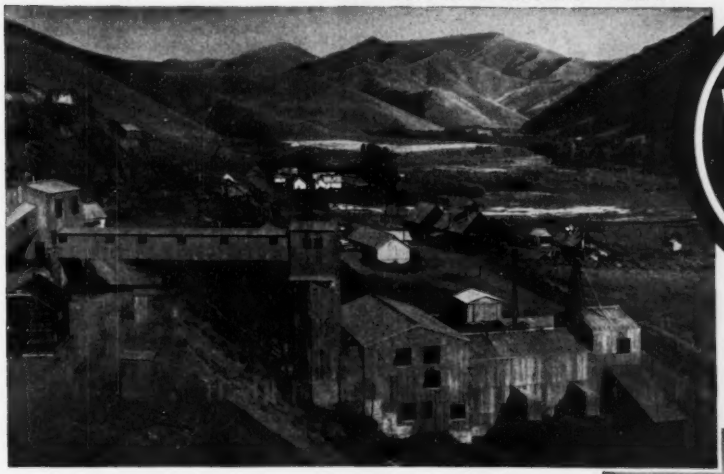
IDAHO

★**Star mine,** owned by the Sullivan Mining Co., a subsidiary of Bunker Hill and Hecla, has now developed into the largest zinc producer in Idaho: It had a 1951 output of 20,000 tons of zinc, or about 25% of Idaho's annual production.

★**Nabob Mining Co.,** on Pine Creek, is drifting easterly towards the Sidney on the high-grade streak of ore discovered in the lower tunnel, and is producing about 80 tons daily from

NOW IN OPERATION!

Triumph Mining Company's New WKE Built Selective Flotation Plant



WKE

This new lead-zinc Flotation Plant, located at Hailey, Idaho, recently commenced full-scale operations. Designed and constructed by Western Knapp Engineering Co., this newest addition to the industrial strength of America has a capacity of 200 TPD.

The extensive and specialized skills available in the WKE organization have been responsible for many other noteworthy additions to the nation's industrial capacity.

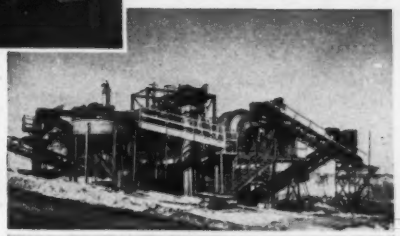
Among these are:

1. **W. S. MOORE CO.,** Virginia, Minnesota. A 150 TPH iron washing plant completed in 1951—included are an HMS Mobil-Mill and auxiliary washing facilities engineered and designed by WKE.

2. **HART & HART,** Providence, Kentucky. A 150 TPH HMS Mobil-Mill washed coal plant with auxiliary table treatment of fines—plant installation designed by WKE.

3. **BASIC REFRACTORIES, INC.,** Gabbs, Nevada. A 50 TPH HMS Mobil-Mill plant for processing brucite—engineered and designed by WKE.

4. **DEL MONTE PROPERTIES CO.,** Pacific Grove, California. Design and engineering services for construction of a unique 50 TPH sand attritioning and selective flotation plant.



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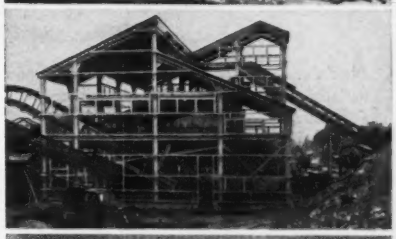

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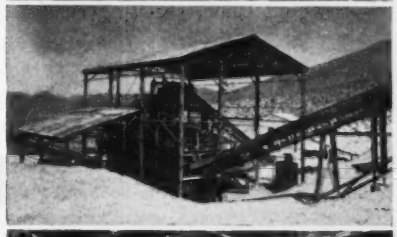

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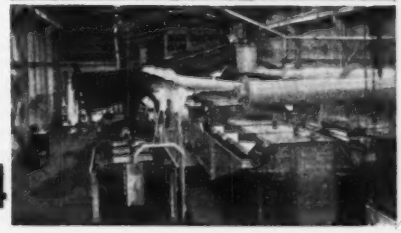

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Idaho *(Continued)*

a 5-ft. streak. Already a carload of the concentrates estimated at a combined zinc-lead content of 25% and valued at $7,000 has been shipped to the smelter. The Nabob mill, which has 300 tons daily capacity, is operating full time on ore from the lower and upper workings.

★**J. R. Davies** of Boise, owner of the Princess Blue Ribbon mine and concentrating mill in Camas County, has purchased the nearby Butter Cup group of mining claims, which are reported to have produced 42,000 oz. of silver and 805,000 lb. of lead in the early 1890's. Production is reported to have been hand sorted, resulting in the accumulation of a stockpile of zinc ore which Davies plans to ship, partly crude, while milling the balance. He plans to be producing concentrates in May.

★**The cost** of diamond drilling has more than doubled since the close of World War II, according to J. L. Havlick, owner of the Havlick Diamond Drill Co., Spokane. Current charges are about $3 per linear ft. for diamond drilling underground and $4 to $5 per ft. for drilling from the surface under average conditions, he said.

Causes of the advance in drilling costs are several; principal among them is the labor cost. On top of this is a 300% rise in cost of industrial diamonds since OPA ceilings were removed in 1948.

Crushed bortz, diamond particles used in the manufacture of diamond grinding wheels, and saws, now cost more than new industrial diamonds did before the war.

★**Pine Creek Zinc-Lead** Mining Co., owner of the Little Pittsburgh mine, reports a profit of $30,562 from royalties on ore produced by the Mascot Mining Co.

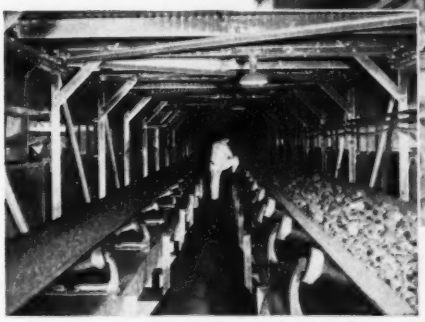
★**Whitedelf Mining Co.** at Clark's Fork, Idaho, is preparing to sink a shaft at a cost of $120,250, half of which is to be furnished by DMEA. The objective is the 800-ft. level, where the U. S. Bureau of Mines opened 4-ft. of ore more than a year ago. It assayed 17% lead and 22.2 oz. silver per ton. The property has been a heavy producer.

★**Hecla, Newmont, New Jersey Zinc and Atlas** have completed surface preparations for sinking the Atlas shaft from the 800 to the 2,100-ft. level, by enlarging the tunnel portal to the shaft collar, enlarging the waste and ore bins, and installing a new Coeur d'Alene Hardware electric hoist of 450-hp capacity. Sinking operations will be speeded up by use of a new clamshell mucking machine, first used in Hecla's Rock Creek development.

★**Idaho Beryllium & Mica Corp.** of Caldwell, Idaho, has been granted a $125,000 production loan, according to Howard P. Sherman, mining engineer for the RFC's Spokane agency. Most

24 U. S. Rubber Conveyor Belts operate in Inland Steel's Price, Kentucky, Coal Preparation Plant

BELT CARRYING run-of-mine coal discharging into blending bin through tripper.



BELT AT LEFT takes ¼" x O raw coal from blending bin to surge bin. Belt at right conveys 5" x ¼" raw coal from blending bin to wash box.

In this modern coal preparation plant, 24 U.S. Giant Conveyor Belts carry run-of-mine coal, fine coal, rock and refuse through the various preparation processes. These belts range from 24" to 54" in width and vary from 37 to 1,786 feet in length—totaling 9,729 feet.

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However, their non-critical charge characteristics are only one of their advantages. They are *durable mechanically:* grids, containers and other structural parts of the cells are of steel. The alkaline electrolyte is a recognized preservative of steel. They are *foolproof electrically:* they are not injured by short-circuiting, reverse-charging or similar accidents. They *withstand temperature extremes:* they are not injured by freezing at any state of charge because the density of the electrolyte does not vary appreciably with the state of charge; they are easily ventilated for rapid cooling. They can *stand idle indefinitely* without injury: they are merely discharged, short-circuited, and stored in a clean, dry place.

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STORAGE BATTERIES

Idaho *(Continued)*

of it will go for milling machinery for production of beryllium. The company's mine is at Dreary, Idaho. The mine's principal production, however, will be "mica flour," for which a ready market also exists.

★**Federal Mining and Smelting Co.** is engaged in a campaign to lengthen the life of the Morning mine. The company now plans to sink the shaft another 200 ft. below the 5,000-ft. level. The new 5,200-ft. level will be 1,060 ft. below sea level. In addition, the company participating with Day Mines, Inc., is driving a crosscut from the 3,650-ft. level of Morning mine to explore the West Independence claims and the Lucretia property. Federal Mining and Smelting Co. jointly with Day Mines, Inc., has also purchased the Fanny Gremm claim and expects to explore this ground in conjunction with the West Independence project.

ILLINOIS

★**Divisional offices** of the Aluminum Company of America, including Alcoa Mining Co.'s St. Louis office, will be moved to Pittsburgh, effective within the next few months, Walter S. Skeels, works manager at Alcoa's fluorspar division at Rosiclare, announced. The New York office also will be transferred. All offices will be housed in the company's new Pittsburgh building.

A 700-ft. ventilation and pump shaft on the crosscut between the Blue Diggings vein at the Rosiclare, Ill., Fairview shaft and the Good Hope vein, now is being installed by Alcoa. Crosscutting has reached a point 800 ft. from the Good Hope. A year will be required to complete installation.

KENTUCKY

★**Alcoa Mining Co.**, as part of its fluorspar mining expansion program, has begun development work at two Livingston County properties. The Bailey shaft at the Klondike mine will be extended from 220 to 500 ft., and construction of a new 500-ft. shaft at the old Silver-Royal mine, whose ore vein extends under the Cumberland River, was started in March. The Silver-Royal, one of the oldest mines in the Kentucky-Illinois fluorspar district, has been idle for years. Both properties will be ready for operation in about a year.

MICHIGAN

★**Pickands, Mather & Co.** has begun the development of what may become a large open-pit mine on the site of the old Fortune Lake mine near Iron River and Crystal Falls. The old Fortune Lake mine was opened by Ogle-

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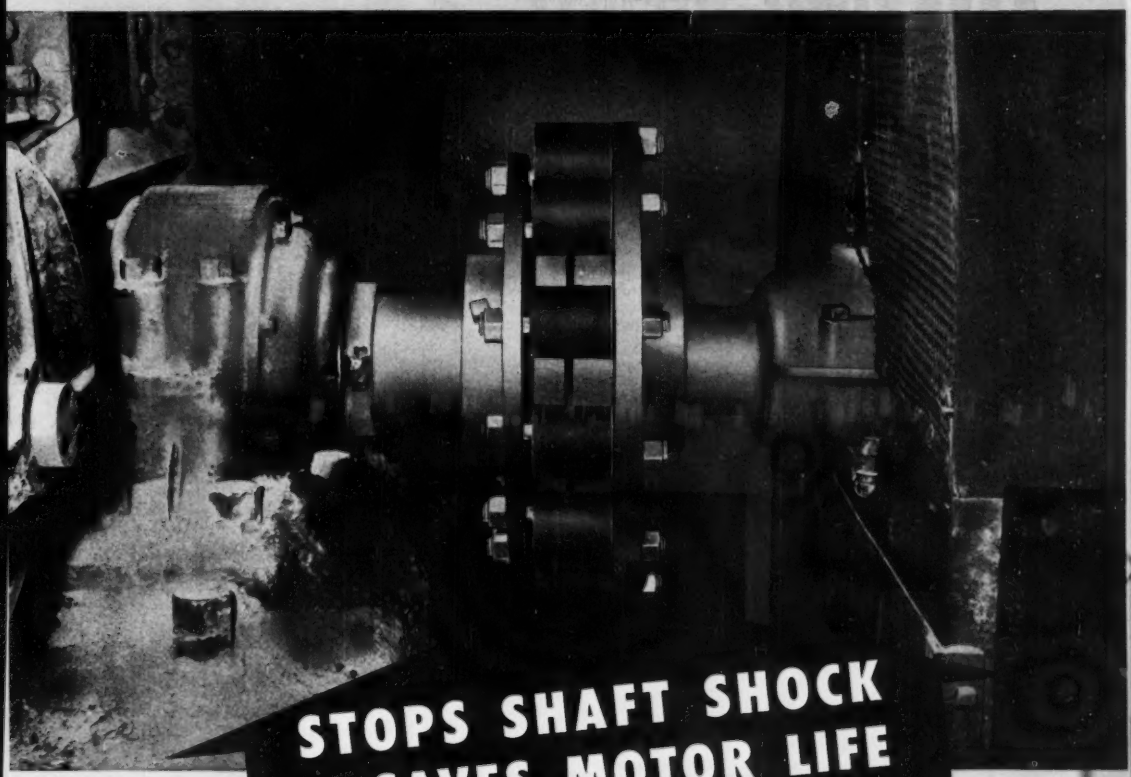

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Michigan *(Continued)*

bay, Norton & Co. and 15 small homes were built for employees. These are still standing. The mine was abandoned in 1920 after a 275-ft. shaft had been sunk by Oglebay, Norton. The shaft will be repaired and dewatered and a crosscut driven under the proposed pit area for drainage. Pumping will be by deep-well pumps from the shaft. Harold J. Richards of Caspian, general superintendent for Pickands, Mather & Co. on the Menominee Range, says that the company has acquired five 40's at the property. Stripping will range from 75 to 90 ft. of overburden and is expected to begin by July. About 30 men are already at work building roads, diverting Briar Hill Creek and repairing the shaft. Mr. Richards says that Pickands, Mather expects to mine a large amount of ore by open-pit methods and there are no present plans for underground mining when the pit ore is exhausted.

★**Results** obtained at the M. A. Hanna Co. pilot plant on the Groveland property in Dickinson County (of which Iron Mountain is the county seat) are said to confirm previous laboratory findings. They indicate that a substantial operation in the Groveland area may be possible. Further research work will be carried on this year. The pilot plant went into operation in late 1951.

★**Inland Steel Co.** pioneered the use of belt conveyors in Menominee Range underground mines. The first belt was installed at the Sherwood mine in 1946. After adding other belts at the Sherwood, Inland has placed a main level transportation 34-in. conveyor in its Bristol mine.

★**The new Wauseca mine dry** contains all the features of a modern change house, including a well lighted concrete tunnel which connects the dry with the shaft. Separate sections are provided for working clothes and street clothes and there are ample shower facilities. A separate section is assigned to foremen. All Wauseca employees use the dry if a change to working clothing is necessary.

In the shaft a new, two-deck, all steel cage has been installed which can accomodate 24 men on each trip. Everything that can add to the safety or convenience of employees has been included in this M. A. Hanna dry.

★**Pickands, Mather & Co.'s** new chemical laboratory at Verona, near Ramsay, handles about 200 iron ore samples each day and makes some 80,000 assay determinations a year in grading more than 3 million tons of Gogebic Range ore.

★**Michigan Corp.** and Securities Commission has issued a certificate of incorporation to the Humboldt Mining Co., owned jointly by Cleveland Cliffs Iron Co. and Ford Motor Co. The new company was formed to develop the Humboldt mine on the Marquette Range, near Ishpeming, and plans to produce a commercial concentrate from the jasper iron formation.

★**The M. A. Hanna Co.** has asked for bids for the construction of a new engine house for its new Cannon shaft at Stambaugh, Menominee Range. The shaft is now down to the ledge where the company will take over its sinking from the contractors who did the work through the surface. It will add materially to production at the Bengal-Tully mine.

MINNESOTA

★**Myers Engineering Co.** formally opened its sales and parts quarters at Buhl on March 10. They handle Dart mine trucks, mine equipment, and diesel truck engines.

★A second pilot plant is being constructed at Riverton, near Crosby, on the Cuyuna Range to determine if high-grade manganese can be commercially produced from the low-grade Cuyuna ores. Manganese Chemicals Corp. of Minneapolis is building the plant. The first pilot plant is at Fort Snelling where a USBM process for recovering manganese is being tested. At present, the United States imports about 90% of its manganese.

★**Sidney A. Frellsen,** director of the water division in the state conservation department, at a meeting in St. Paul on March 5, said that water use in the Minnesota mining area is expected to triple in the next 25 years. He said the increase in low-grade ore operations would raise the area's water consumption from the present 55-million gal. per day to 171-million gal. per day by 1975. Conservation Commissioner, Chester Wilson, said the nine hearings that have been held at various places in the state have shown the need for more accurate information about the state's water resources and legislation to determine how available water should be divided when there is not enough to go around.

★**The M. A. Hanna Co.'s** new Mallen mine on the Cuyuna Range, which was stripped by dragline, will enter the shipping list in 1952.

★**Whiteside mine** of the Snyder Mining Co., near Buhl, a former underground mine which made its last shipment in 1927, is being stripped to be an open-pit producer. A skip will be used to hoist the ore to the surface as at the South Agnew and Schley mines. Estimated reserves at the Whiteside are about 4-million tons.

★**Reserve Mining Co.** has announced a 50% expansion of its Babbitt-Beaver Bay taconite concentration plans. Instead of the original plan for a plant with a capacity of 2,500,000 tons per year, to be completed in 1955, the new plans call for a capacity of 3,750,000 tons annually, with completion expected in 1957. The larger program (total cost may exceed $160-million) is

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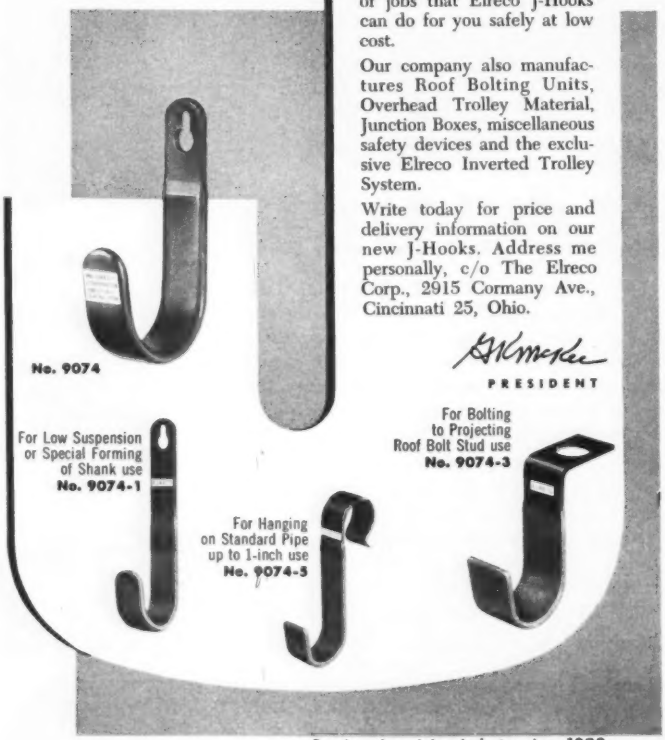
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A COMPLETE LINE OF TROLLEY MATERIAL FOR EVERY MINE

Minnesota *(Continued)*

called for by the plans of both Armco Steel Corp. and Republic Steel Corp. to increase steel production capacity.

Concentrates from Reserve's plant will be in the form of walnut-size pellets running over 60% in iron. First stage crushing will be done at the pit, and will be handled by "the world's largest crusher," now being built by Allis-Chalmers Mfg. Co. Final crushing will be done at the Beaver Bay plant. This plant will be more than 1 mi. long. In the meantime work is well under way on eight dormitories which are designed to accommodate some 2,000 workers who will be needed for the big construction program.

Beaver Bay, formerly a small fishing village, is expected to become a community of 10,000 or more. The restoration of the old sintering plant at Babbitt is progressing and equipment is being installed. This work was delayed in March by a union jurisdictional dispute between two AFL unions over assignment of work installing furnaces.

Right of way for 47 mi. of railroad between Babbitt and Beaver Bay is being cleared.

★**Minnesota-Huron Iron Co., Ltd.**—exploration subsidiary of the W. S. Moore Co. of Duluth—has changed its name to Trent River Iron Co., Ltd. Exploration work is being carried on in eastern Ontario with K. F. Bickford of Ottawa as manager.

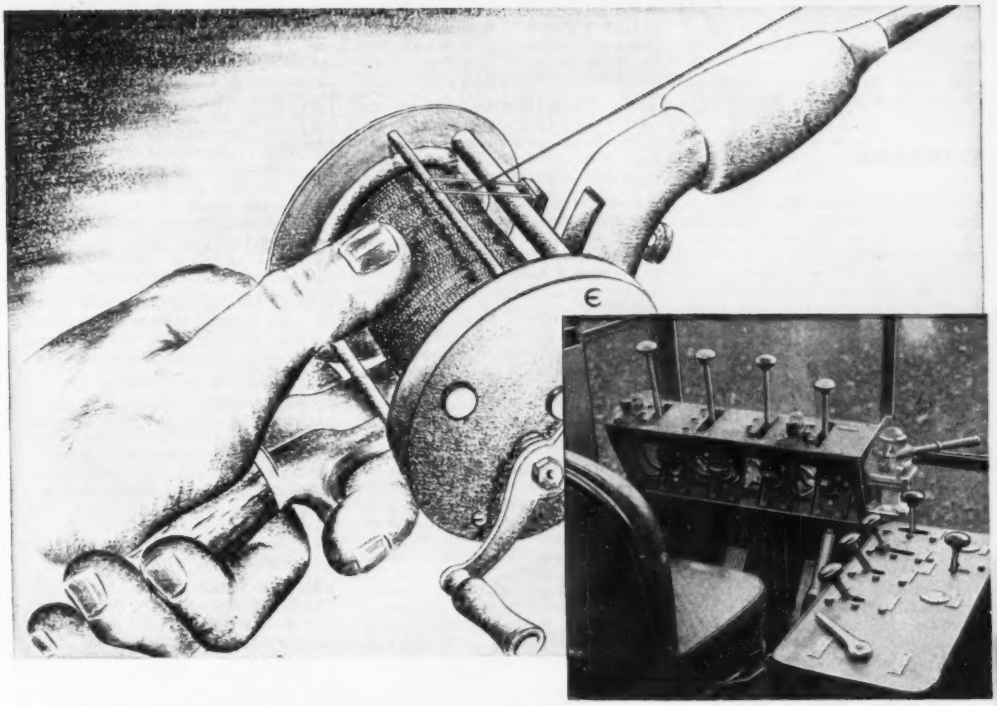
★**S. J. Groves & Sons Co.**, Virginia, Minn., are moving dirt on a large contract for Pickands, Mather & Co. at the Bennett mine, near Keewatin.

★**E. W. Coons Co.** has completed a stripping program at the Genoa-Sparta mine, east of Eveleth, and the Duluth, Missabe & Iron Range R. R. is building a siding into the company's Sidney mine which it stripped last year. The Sidney will ship ore in 1952. A small tonnage was shipped from the mine in 1941.

Coons has also completed some additional development at its Julia pit, near Virginia, in preparation for the coming ore season. Duane S. Meyers recently joined the company as general superintendent of its mining operations.

★**At the South Agnew mine**, M. A. Hanna Co., stripping of the Agnew No. 2 has been carried on with a 7½-yd. shovel, while another shovel was removing lean ore and rock to lower the skip pocket. Stripping was used to make a new tailings dam.

At the Morton, the 1,150 dragline has dug a drainage ditch around the crest of the pit and a 7½-yd. shovel has been loading surface stripping. Here, too, the dirt has been used for building a tailings basin. Other M. A. Hanna properties at which stripping has been carried on during the winter are: the Duncan, where the stripping program will connect the Duncan with the Douglas pit and allow Douglas ore to be hauled out through



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There are other advantages, too. LIMA precision air control promotes long life of the machine and uniformity to the operating cycle. It also automatically compensates the adjustments of the clutches for wear of lining and to meet weather and operating conditions

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Minnesota *(Continued)*

the Duncan pit; the Weggum; Buckeye; Section 18; Carlz; Perry; Mississippi group; Kevin; Olson and, on the Cuyuna Range, the Snowshoe.

MONTANA

★**Coronado Copper & Zinc Co.** of Los Angeles, after two years' negotiations, has taken over for exploration and development what is known as the Bluebird Group and other mining properties in the southwest portion of Butte, according to Blair Stewart, vice president of Coronado, who was in Butte the middle of March establishing office headquarters. Coronado is controlled by Harvey Mudd and associates of Los Angeles, who are operating mines in Arizona and California, the Coeur d'Alene district in Idaho, and on the Island of Cyprus in the Mediterranean.

Formerly owned by a group of Boston stockholders, headed by Ferdinand Van Zandt, the Bluebird was a famous producer of silver ore which it treated in a chlorination plant, but not much underground work has been done on the property since it shut down in 1896, and Van Zandt committed suicide. The property is opened by a shaft, and, according to reports, there is quite a little zinc in the ores, which, in the early days, was a liability instead of an asset. Mostyn G. Grant, one of Coronado's exploration engineers, will supervise the initial work at the Butte property, which it is expected will begin within a few months.

★**Mineral King Mining Co.** will resume operations within a short time in developing lead-silver ore at its property 3 mi. north of Saltese, Mineral County, and about 12 mi. east of Mullan, Idaho.

★**Trout Mining Division** of the American Machine & Metals, Inc., Philipsburg, producing lead-zinc-silver ore and chemical black manganese ore, has added a bank of flotation cells to concentrate pink manganese ore (rhodo-chrosite) in its new mill.

★**Contracts have been let** for the erection of the new petroleum and physics building of the Montana School of Mines at Butte. The building, when completed, will cost around $300,000 and will be located on the west end of the campus.

★**Western Montana Exploration & Development Co., Inc.,** has obtained permission and priority to start construction of a 200-ton flotation mill on June 2. President Roy W. Key reports that it will make three products: zinc, lead-silver, and copper-gold. It will be an all-weather structure, built at an altitude of 6,010 ft. to process ore from the Shamrock orebody (formerly owned by Key & Durand) in Granite County.

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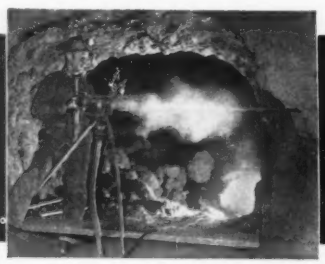

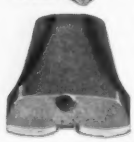

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NEVADA

★**Construction** of the new Kaiser Aluminum & Chemical Corp.'s fluorspar mill near Fallon, is getting under way under direction of H. S. (Pete) Fowler, Manteca, who is superintendent of the project. The company has purchased a 50-acre site on the banks of the Carson River west of Fallon and north of the Southern Pacific tracks. Design details for the new plant have been approved and negotiations have been made for adequate supply of electric power.

★**About 300 tons** of lead-zinc-copper ore daily is being milled by the Copper Canyon Mining Co. at their Copper Canyon property, 19 mi. south of Battle Mountain.

★**Reconstruction** of the Northumberland mill is progressing at Lincoln tungsten property of Black Rock Mining Co. in the Hiko district. Buildings and machinery have been moved from the Northumberland gold mine and as soon as new units are added to the plant, production of tungsten will begin. The mill formerly treated 750 tons of gold ore.

★**Jesse R. Wilson,** Sparks, has taken a five-year lease on the Iron King mine west of Fallon, and is developing the property to produce ore for shipment to Japan. Wilson and his associates acquired control of the mine from Harry Howard, Fallon, and plan to turn out at least 1,000 tons of ore per month. Machinery and equipment is now on the ground, and production will start soon.

★**J. I. Crowell's** fluorspar mine at Beatty is producing 25 tons of high-grade ore daily. The product is trucked from mine to railhead at Las Vegas, and is shipped to steel mills on the Pacific Coast. The Crowell property has been in production for many years, and reportedly has a good ore supply.

★**Herman M. Cooley** and Dr. Kurt L. Hartoch, Winnemucca, are starting a development program at their Blue Light tungsten mine 50 mi. north of Ely. A shaft will be sunk to determine extent of the deposit. Outcroppings indicate the property has ore of high tungsten values. About 100 tons of ore approaching 5% WO_3 is on top of the ground.

★**Iron-ore shipments** are being made from the Talbot property north of Buckskin, with George N. Tausan, Standard Slag Co. foreman, in charge. A new road has been built to the property and ore is being trucked under contract to Wabuska, where one car daily is being loaded. Mining is also under contract to Joe Bednar.

★**Basic Refractories, Inc.** has acquired the Nevada property of the Sierra Magnesite Co. and has leased a number of mining claims adjoining Basic's property at Gabbs. Claims will be operated in conjunction with other

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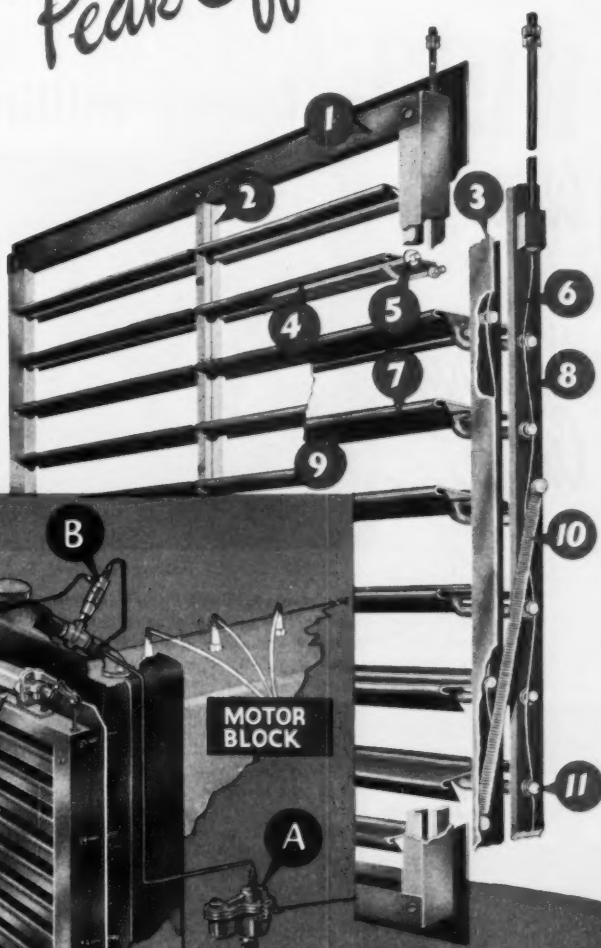

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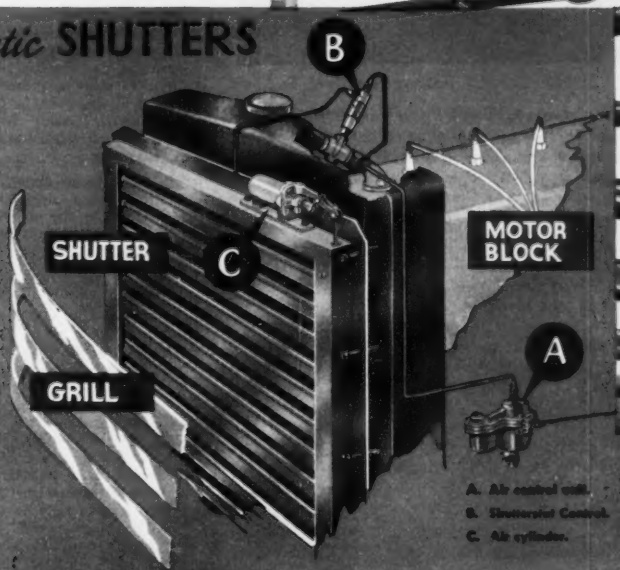

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Nevada *(Continued)*

properties owned by the company and are expected to improve Basic's accessibility to ore already developed in the area. The new claims have a substantial reserve of developed magnesite which the company uses at its Gabbs plant.

★**Newmont Mining Corp.** is launching a new exploratory program in the vicinity of drilling operations carried out in 1949 south of Goldfield and near Goldfield summit, this spring. Two drill holes are being put down to an undetermined depth as the first phase of the program. The Newmont Corp. had been active in the Goldfield district since 1945, but closed down its operations there last year.

★**Ball Mining Co.** is engaged in prospecting, locating and doing assessment work in the Pine Forest Range of Humboldt County, operating 36 mining claims in the area. Partners in the operation are A. O. Skatterud, A. T. Ball and Odile Ball, all of Oregon.

★**Warren W. Overholser and Amien M. Perry**, Fernley, have been doing exploration work on their Mount Montgomery fluorspar mine. Negotiations have been in progress for sale of the property to a large eastern firm, and two engineers have been on the site considering the feasibility of installing a plant to produce acid-grade ore.

★**Kennecott Copper Corp.** has been installing sinker pumps in its Kellinske and Star Pointer shafts in order to get the two properties back into operation. On Mar. 21 water from an underground fissure broke through into the Kellinske and drowned out three pumps on the pine-level pump station which lies about 600 ft. below the surface. The water filled the shaft to a depth of more than 180 ft. and on the following day surged into the Star Pointer shaft, flooding two of its pumps. The break-through lowered the level in the Kellinske shaft 70 ft.

★**An estimated 300,000 tons** of commercial-grade hematite iron ore will be mined at Palisades this year, according to officials of the J. R. Simplot Co.

The mine, 60 mi. southwest of Elko, Nev., first began production in September of last year, and prior to this winter's bad weather shipped 109,000 tons of ore. This year's operations are expected to start around May 1. The ore is shipped to three major steel mills in Japan.

George McHugh, consulting engineer for the company and manager of the mine at Palisades, said the mine this year will employ an estimated 50 men in the open-pit operation and would use around 100 trucks and drivers. McHugh also announced the appointment of John Kobe, manager of the Fort Hall phosphate mine, as superintendent of the iron mine. He said Kobe would continue as manager of the Fort Hall operation. The appointment was effective April 1.

NEW MEXICO

★**Since relaxation** of Indian Bureau regulations permitting Navajo Indians to sublease mining claims on the reservation to non-Indians, 78 applications to mine uranium have been received by the Navajo Tribal Advisory Committee. Among these, the Navajo applications to mine will be considered first.

★**United States Smelting & Refining Co.** has filed application for a federal patent to a group of 33 mineral claims in the Pinos Altos district in Grant County, to mine lead-zinc ores. The area formerly produced gold and silver, but has been inactive for 40 years.

★**Phelps Dodge Corp.**, after a 31-year lapse, plans to revive its Burro Mountain copper mine at Tyrone, about 60 mi. north of the Mexican border. Originally, the copper orebody, 6,000 ft. above sea level, was worked for just five years, 1916-1921. Operations quit because of low copper prices and high mining costs. Recent churn-drilling by the company uncovered ore averaging somewhat less than 1% copper, which may be mined by open pit. The company has estimated that ore reserves of at least 100-million

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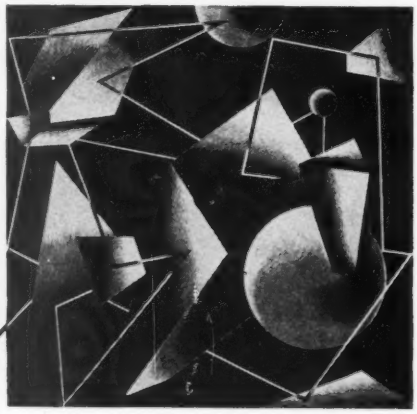

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TR 200 MOTOR WAGON SPECIFICATIONS

GENERAL

CAPACITY	
Struck, cu. yds.	11
Heaped, cu. yds.	15
Tons	18
OVERALL DIMENSIONS	
Length	25'9"
Width	10'7"
Height	10'0"
WHEEL BASE	13'7"
WHEEL TREAD	
Tractor	6'8"
Wagon	8'8"
TIRES	4—21:00 x 25—24 ply rock lug
BRAKES	
4-wheel air Timken-Detroit	18" x 7"
TURNING	
Width required 180° turn	31'3"
Degree of turn each way	60°
HYDRAULIC SYSTEM	LPC Fluid Power Unit
Steering—25 GPM	Model HU25
Wagon operation—40 GPM	Model HU40
SHIPPING WEIGHT	
(Approx. in lbs.)	40,000

T 200 TRACTOR

ENGINE	
Buda Diesel Model	6-DA-779 176 HP
or	
Cummins Diesel Model	HRB-600 165 HP
ENGINE CLUTCH	17" Lipe Rollway
TRANSMISSION	Fuller 5A1120
SPEEDS	
(at 1800 RPM—MPH)	From 2.46 to 21.63
STARTING METHOD	Electric 24 V
AIR COMPRESSOR	
Bendix-Westinghouse	7¼ cu. ft. capacity
ELECTRIC SYSTEM	12 V
FUEL TANK CAPACITY—U. S. gallons	70

R 200 WAGON

MISCELLANEOUS DIMENSIONS	
Loading height, rear	5'6"
Loading height, side	8'3"
Bowl width	8'0"
Bowl depth, maximum	4'8"
Bowl length	11'3"
OPERATING METHOD	
Type of ejection	Rear dump, hyd. lift
Number of jacks (double acting)	2
Size of jacks	8" x 31"
DUMPING ANGLE	70°

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New Mexico *(Continued)*

tons will have to be proved before open pit operations are attempted.

NORTH CAROLINA

★**Miners in the Asheville area** are showing an interest in an offer by the City of Asheville to make its mica resources available for sale.

The Asheville City Council has offered top-grade mica on its watershed for sale. The offer was made after an announcement that the government will pay up to $70 per lb. for top-grade sheet mica and ruby mica. The watershed deposits are believed to contain a large amount of the top-grade silicate.

The city has offered to enter the mining business on a contract basis, allowing a mining firm to operate the veins on a percentage basis. City Manager J. Weldon Weir said he understands that 12½% of the gross would be about right, although the figure would depend upon road conditions and other factors.

The veins are located near the upper levels of the Bee Tree watershed and are most easily approached by the Blue Ridge Parkway.

Weir said the city is open to suggestions and that inquiries have been received from as far away as Kentucky, with some mining firms indicating that they would send geologists to the location to study the deposits.

★**A proposal** that a state-wide Minerals Producers Association be set up in North Carolina to assist the State Board of Conservation and Development in the commercial development of mineral resources in the state was presented to the board's Minerals Committee for consideration at a meeting at Wilmington March 27 by State Geologist Jasper L. Stuckey. No action was taken by the committee.

★**Under the supervision** of mining engineer C. R. Hayes, the old Gold Hill mines in Randolph County are being prepared for copper-gold production. Associated with Hayes are C. O. Manz, who has held a lease on the property since 1933; Frank B. Stimpson and James E. Coald of Raleigh; and H. O. Woltz of Mount Airy.

Hayes' first job will be dewatering the 800-ft. shaft; that will take about three months. The North Carolina State Bureau of Mines will sponsor diamond test drilling.

The Gold Hill mines were opened in 1825, were a major producing group until 1849, and were shut down then when miners left for California. Walter G. Newman is said to have taken out millions in an operation which began in 1880. The mines have been closed since 1933.

OREGON

★**Ray-O-Vac Co.**, Madison, Wis., and GSA have reached an agreement under which the $5.5-million manganese-dioxide plant built by the government at Salem during World War II will continue under company operation. Earlier it was reported that the plant would revert to the government on April 1 after Ray-O-Vac obtained a $475,000 judgment, still unsatisfied, against its subsidiary, Continental Chemical Co., which had been operating the plant. Judgment against Continental was to compensate for advances made to cover operation losses.

Under the new agreement, the Continental company's operation is terminated and operations will be conducted directly by the parent company for a six-month trial period. Ore for the plant's operation comes from Nevada and northern California.

★**Regarding The M. A. Hanna Co.'s** nickel exploration and research on the Riddle deposit, Hanna president Humphrey says that while the ore is a complex one, "we are hopeful of perfecting a commercial process."

★**A report from Albany** stated that an explosion in the USBM laboratory at Albany had injured E. Don Dilling on March 5. Work was being done on a zirconium project. A fire, which was soon put out, following the blast dam-

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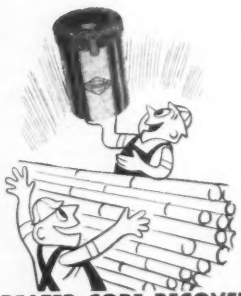

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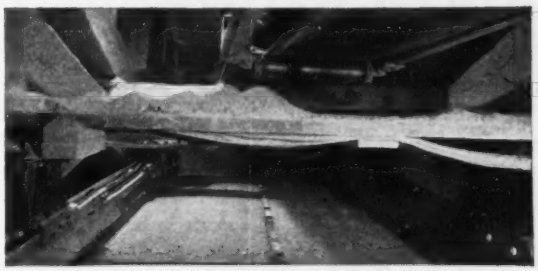
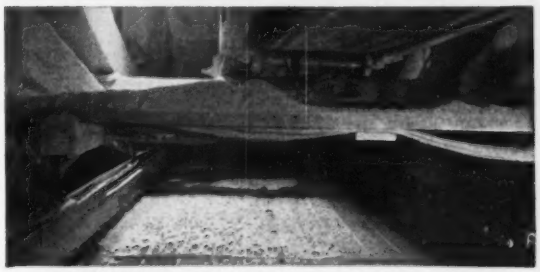


POWER ON — *Thermo-Deck* heating unit keeps screen cloth clear on screen handling pulverized limestone.



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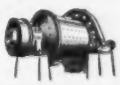

Grinding Mills

Vibrating Screens

Kilns, Coolers, Dryers

Oregon *(Continued)*

aged the interior of the laboratory. On March 14 a second explosion caused injury to Loren S. Schultz who was working on the zirconium project at the Northwest Electro-Development laboratory. A chlorinator furnace lid blew off hitting Schultz in the face. Laboratory damage was slight, Stephen Shelton, director, reported.

TENNESSEE

★**Sisco & Pitts,** independent mining contractors, are mining phosphate on the 375-acre farm of William Howard Ewing, about 7 mi. southwest of Columbia. Product goes to Victor Chemical Co.'s elemental phosphorus plant at Mt. Pleasant. The land will be restored after mining—filled in with stripped overburden at a cost of $100 per acre.

UTAH

★**Members of the** Wage Stabilization Board panel holding job classification hearings related to the mine industry went directly into the field to seek answers on March 28. A tour of the Midvale, Garfield and Tooele smelters and open-pit and underground mines at Bingham and Lark was made by panelists who have been hearing job classification issues raised in connection with contracts sought by the CIO United Steelworkers at United States Smelting, Refining and Mining Co. properties.

The same WSB panel is also hearing evidence on wage questions raised by New Park Mining Co. and Combined Metals Reduction Co.

★**The regional WSB** approved (Mar. 27) wage boosts for 7,712 Kennecott Copper Corp. employees, in Utah, Nevada, and New Mexico as a result of bargaining agreements by Kennecott's Western Mines Division, Salt Lake City, and locals of 15 unions.

Wage increases of 4½¢ per hour were approved for hourly-pay employees, $7 monthly for salaried workers under the Fair Labor Standards Act, and $10 monthly for non-supervisory employees not covered under the act.

Approval of pay raises for 4,244 employees in Utah and 1,429 McGill, Nev., workers was based on a cost of living formula. Although the cost of living grant to 2,039 employees at Hurley, N. M., would have been a flat 4¢ per hour, the additional ¼¢ an hour was authorized "to correct an intra-plant inequity."

★**A $500,000 electrical** modernization program at the Magna mill of the Kennecott Copper Corp. is now under way with a similar project under consideration for the Arthur mill. Chief electrical engineer R. J. Corfield said it was first recognized in 1937 that the Magna electrical transformation and distribution system was inadequate.

The new system is designed to replace completely, rather than supplement, the old. Work includes erection of a new primary substation, primary (13.8 kv) distribution system, secondary unit substations and secondary distribution systems.

In addition, the principal pumping plant for milling water is being rebuilt, along with its electrical substation facilities. Some 14 new unit substations will be constructed at electrical power load centers in the mill to serve the 12 concentrator sections.

New system will eliminate completely the present cable tunnel in the plant secondary distribution system, and about 50% of the present cross feeders. The system will be of the unit type wherein each mill section is served from a unit substation. To make the system virtually fireproof, main cables will be rubber insulated, neoprene jacketed and installed in open cable racks isolated from combustibles.

Other specific changes in the power distributing system will include elimination of water-cooled transformers through use of self-cooled fan units, elimination of all secondary oil circuit breakers through use of metal-

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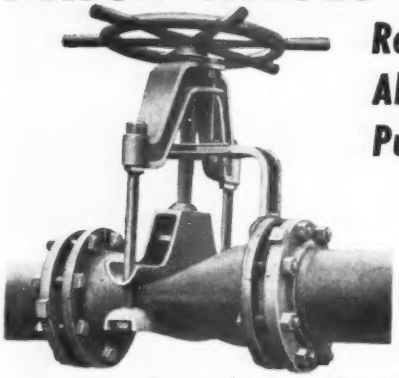
Rubber
PINCH VALVES



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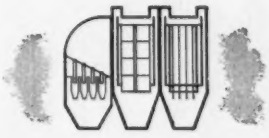
Mechanical Collectors

... the most efficient, most compact, most trouble-free mechanical equipment for recovering suspensions from gases. Because of their unique small-tube design, MULTICLONES are unsurpassed in mechanical recovery efficiencies—require less space, less maintenance, and are far simpler to install. No filters or screens to replace, nothing to burn or cause fire hazards, no high speed moving parts to repair or replace. These and many other advantages make MULTICLONE Collectors the logical choice on installations where mechanical recovery is selected.



CMP UNITS

(Combination Multiclone-Precipitator)

... combine, in *one* compact installation, both mechanical and electrical recovery principles so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally removes the larger and heavier suspensions (down to a few microns in diameter) ... and the COTTRELL section then electrically removes the very small particles remaining in the gases. Thus, the bulk of the recovery is obtained with relatively low-cost equipment, and the final clean-up is obtained with equipment having unusually high recovery efficiency—approaching theoretically perfect, if desired.

The recovery of suspensions from gases is a highly exact science and every problem is different. Some require mechanical methods—others electrical methods—still others a combination of mechanical and electrical methods in proper balance to meet the individual requirements of each application. No matter what your problem, remember that only Western Precipitation has had years of field experience in BOTH mechanical and electrical methods!

Send for descriptive literature!

Let our experienced engineers study your recovery requirements and make an unbiased recommendation on the equipment best suited to your particular problem. A wire, phone call or letter to our nearest office places this unique "know-how" at your service, without obligation.

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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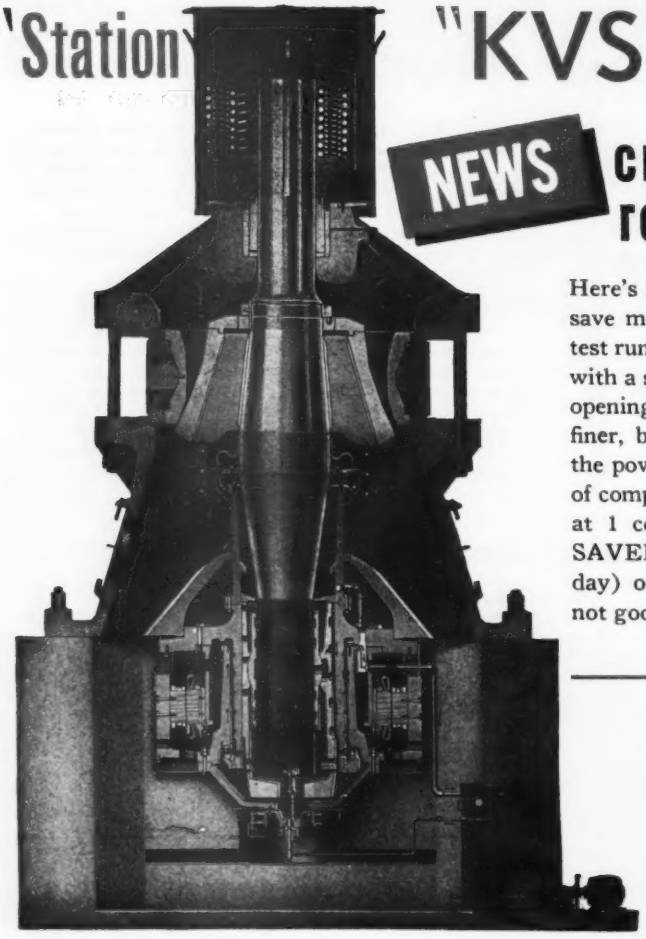
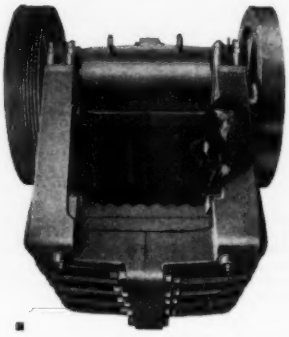
"Station" "KVS" BROAD



NEWS CRUSHER RECORD TOPPLES IN TEST!

Here's news for you men who want to save money. Here are the results of a test run on a Kennedy No. 37½ Crusher with a special grinding ring and 3" feed opening. Result—got 50% MORE of a finer, better product for about HALF the power cost of a competitive crusher of comparable size. Figuring power cost at 1 cent per h.p. hour, this "KVS" SAVED some 40 h.p. (or about $11 a day) or about $3,000 a year! If that's not good news, we'd like to hear better!



QUIZ DID YOU KNOW THAT . . .

There's less wasted power and effort in the "KVS" SWING JAW CRUSHER. It's because we redesigned the STATIONARY jaw to carry 50% of the crushing load. You get more production and get it more efficiently. There's lower maintenance cost, too. The swing jaw is ALL IN ONE PIECE, except for the crushing plate. That's removable. Note also — Swing and Stationary jaws are INTERCHANGEABLE, and reversible end for end. That DOUBLES jaw-crushing life for you "KVS" users!

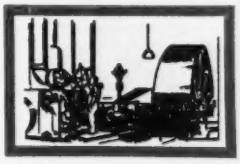
TUNE IN NOW ON "KVS" AND

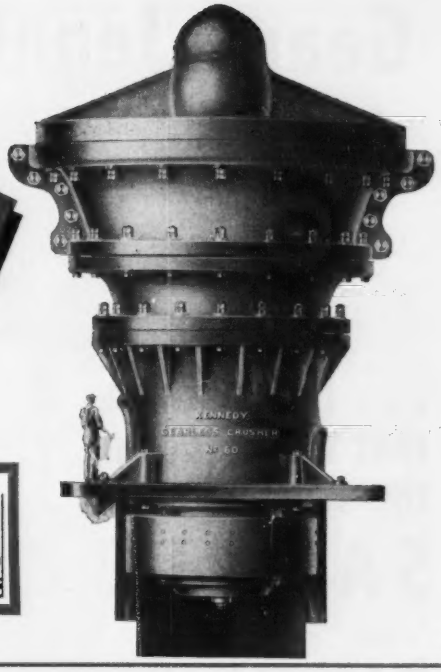
CASTING!...

"GHOST" ENGINE STILL LIVE IDEA!

DRAMA

The old Corliss Engine with the big flywheel is worth thinking about! Because it means that when you use a "KVS" Gearless you get ADDED FREE POWER for no added cost! That's the extra power that results when a big pulley or flywheel whirls around—like the big pulley on the old Corliss Engine. There's a BIG Pulley in the "KVS" Gearless! It whirls at 3,500 ft. per minute—and the EXTRA crushing energy or crushing power you get is due to "KVS" superior design. The 8-ton pulley (used in a "KVS" Crusher weighing 400,000 lbs.) whirls so easy you can turn it with TWO FINGERS! In short, more CRUSHING for LESS POWER COST makes "KVS" the RIGHT idea for you.

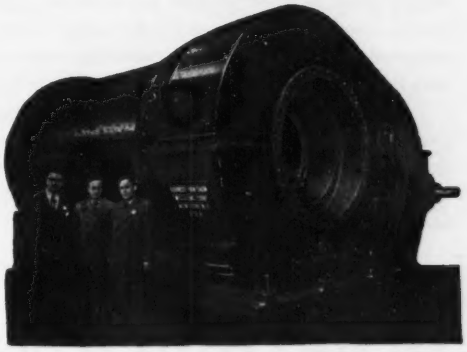




TEAR UP THAT $5,000 CHECK!

FINANCE

Don't spend it foolishly—take the SURE way and save that $5,000 on a 10 ft. tube or ball mill. How? Buy a "KVS" with integral gear drive. The Kennedy integral gear drive enables motor to be direct connected to driving shaft. On a 10 ft. mill this enables you to purchase the synchronous motor at a saving of about $5,000. Shaft carried in roller bearings that cannot be set wrong. Pinion shaft to which the motor is connected runs at 600 r.p.m.; other pinion shafts run about 180 r.p.m. "KVS" trunnions on large sized tube and ball mills are carried on oil. Never wear out, use little power. All gears and bearings automatically sprayed with oil before tube mill is started (design patented).



Write today for complete set of "KVS" Bulletins if you want MORE production with LESS cost.

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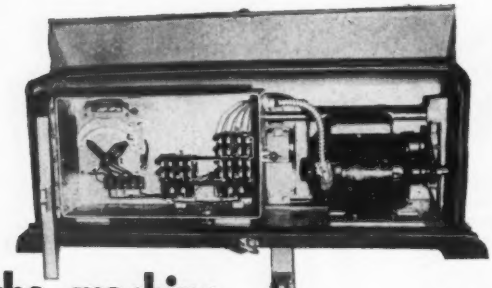
Geary-Jennings



. . . the machine that tracks down the most elusive SAMPLE

One of the toughest tests of efficient sampling is ready adaptability to changes in composition of material along the length of the stream. If this is a factor in your sampling problem, a Geary-Jennings installation is definitely a MUST.

Besides providing the basically true sampling principle — "all of the stream part of the time" — the Geary-Jennings Sampler can be set at any desired interval between cuts and at any speed of travel at right angles across the stream. This means sampling geared to the most radical changes in stream composition of either wet or dry materials. Cutter widths available to handle lumps or bulky solids.

The entire sampling procedure is automatically controlled and the mechanism is tightly shielded from tampering or intrusion of dirt.

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Utah *(Continued)*

enclosed air-breaker switches, and decentralization of feeder cables.

★**The National Farmers Union** announced tentative plans for the ultimate construction of a $5-million fertilizer plant utilizing the oolite deposits in Rich County, Utah. C. E. Huff, general manager of the farm group's service corporation, reported a sulphuric acid process for extracting triple phosphates from the oolite would be employed, when and if such a plant is erected in either Utah or Colorado.

The National Farmers Union has 13 mineral claims in the Crawford Mountain area of Rich County which are believed to run from 29% to 35% in phosphorus. Major considerations in controlling the plant construction and subsequent mining operations will be the availability of sulphuric acid and electric power, Huff said.

WASHINGTON

★**Chewelah Copper Co.** which was organized in 1951 to reopen the old United Copper mine near Chewelah reported late in March that the last cave-in had been broken through and that two old stopes were in fair condition. Records from 30 years ago when the mine was closed after reportedly yielding $1½-million from 1908 to 1919, showed over 128,000 tons of ore left in the stopes. The main adit of 4,220 ft. has been rehabilitated since last fall and plans are for opening the drift along the main vein and examining other stopes, according to E. P. Maher, of Yakima, president.

★**W. R. Green,** general manager of Mines Management, Inc., said in March that the 50-ton plant completed at the Advance mine last year would be in operation in the "very near future." He reported that five raises are in ore and work is being started on stopes. The company's Iroquois mine, also in Stevens County, is estimated to have 500,000 tons of indicated ore and 600,000 tons of inferred ore as a result of diamond drilling under a DMA exploration contract of last year. Present plans under consideration for that property include a milling plant with two units of 250 tons each.

★**Experimental work** on trepca zinc concentrates from Yugoslavia is being performed by the Washington State College mining experiment station at Pullman for the consulting firm of Singmaster & Breyer of New York. An electrolytic zinc plant which is to be built soon in Yugoslavia will use results of the work as a help in designing the plant's construction, Dr. R. L. Albrook, director of the Division of Industrial Research at the College, has announced.

★**A new "air-swept" ball mill** has been installed at WSC's experiment sta-

tion which will increase services rendered to mining men of the area. Size of mill feed is controlled by a loop classifier and the rate of feed is controlled by an "electric ear."

★**Gold Gulch Mining Co.,** operating southwest of Wenatchee in the Blewett mining district, made a strike of gold ore in March, according to J. D. St. George who has been working at the property through the winter. He reported that a cut sample assayed $43.50 a ton in gold. In following the vein for 10 ft., a width of 30 in. has developed. Plans are for following the vein and raising in it.

★**Production of lead** in the state during January was 1,110 tons, according to the U. S. Bureau of Mines, or a 67% increase in lead output, compared with a 4% increase for the combined western states. The state's average monthly output for 1951 was 663 tons.

★**It has been reported** from Newport that three businessmen of the town, H. C. O'Brien, R. C. Thamm and Jack Gallagher, have formed a company capitalized at $250,000 to develop an antimony mine in the Wildrose district. Mr. O'Brien reported that assays run more than $400 per ton. The men are negotiating for a government exploration project loan.

★**Howe Sound Mining Co.,** operating the Holden copper-zinc-gold mine, near Lake Chelan, reported net income of $4,601,839 for 1951, compared with $2,562,194 for 1950. This amounted to $9.22 a share last year compared with $5.29 the previous year. Income taxes were $3,571,174 in 1951, compared with $1,301,498 in 1950.

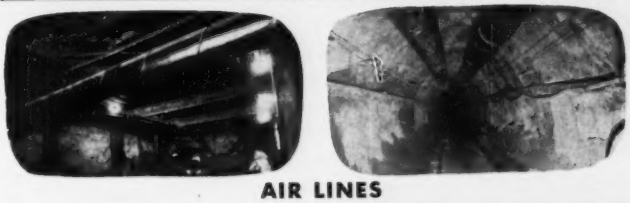
★**G. R. Shallenberger,** northwest representative of Three Peaks Mining Co. of Salt Lake City, with headquarters at West 1827 Ninth Ave., Spokane, said the company will now purchase manganese, manganese iron, copper, scheelite tungsten, nickel and chrome as well as hematite iron ore, and will buy either crude ore or concentrates. It is also interested in leasing or purchasing properties containing these ores. In addition to the Thompson, Electric Point, and Kulzer properties in Stevens County acquired earlier, the company has taken over claims on Buckhorn Mountain in Okanogan County, and eight properties near Moscow, Idaho, and four near Stites, Idaho. "We hope to ship 2,025,000 tons from northwest deposits by Christmas," Mr. Shallenberger said.

★**The first underground diesel** equipment in the state was installed at the Grandview mine in January, L. H. McGuire, of Seattle, chief of the U. S. Bureau of Mines Region II (Northwest) accident prevention and health division, reported. Tests have shown that the workers breathe air well within prescribed purity limits. Dale I. Hayes, western manager of American Zinc, designed the shovel-loader or self-loading transport.

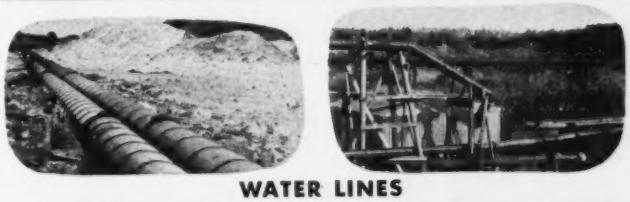
CONSTRUCTIVE SUGGESTIONS

Typical Ways in Which NAYLOR Light-weight PIPE Serves Mining Engineers

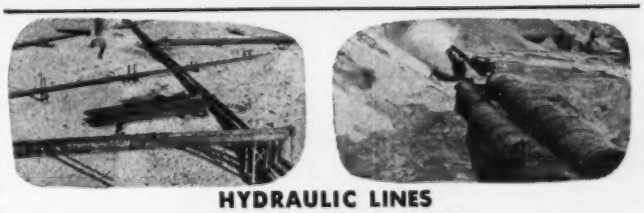
TAILINGS LINES



AIR LINES



WATER LINES



HYDRAULIC LINES

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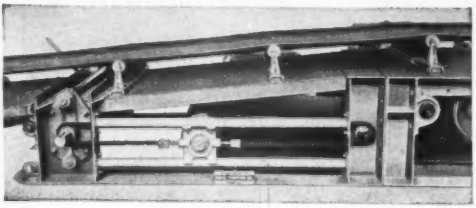
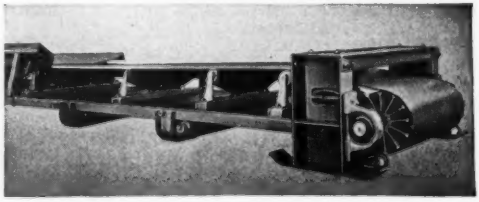


INTERNAL TAKEUP

Located directly back of the drive. Handles 10′ of belt slack. Operated by reversible ratchet-wrench working on gear reduction to minimize manual effort. Double-acting pawl prevents backing-up. Worked from either side of conveyor.

TAIL SECTION

Telescopic type to provide tail takeup action. Easy to clean out—no steel work under tail pulley. Has transverse cover to protect pulley, bearings *and belt*. Strong enough so you can rest a feeder on it.



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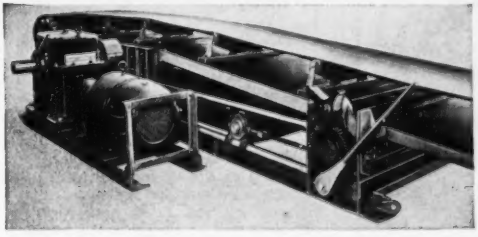
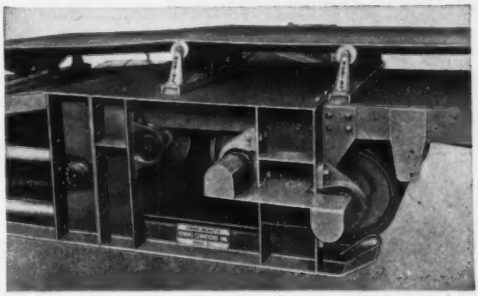


UNIFIED DRIVE SECTION

Motor, reducer and controls mounted on a single base—skid-designed for easy moving about. Can be located on either side of the conveyor. Drive reversible—incoming for men and material, outgoing for high output of product.



SINGLE OR TANDEM DRIVE

Hewitt-Robins Mine Conveyors come equipped with both single and tandem pulley drive elements. Provide ample horsepower for lift and length up to the very limits of belt capacity. Reeving of belt handles level, uphill or downhill service requirements.

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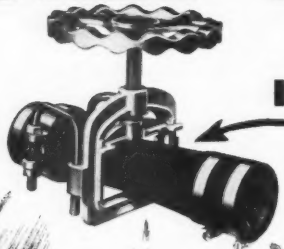

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Basically, the Flex-Valve is just a piece of flexible tubing and a clamp to squeeze it shut. It can no more clog than a length of pipe. So, if you can clog one of them in normal service, just tell us, for the "incredible-but-true" record, how in the world you did it, and we'll send your money back.

Flex-Valves have solved thousands of valving headaches—in as many plants as there have been installations made. They can handle anything that flows, including aerated or fluidized solids. They close bubble-tight over 1/8" solids. Open, the flow is straight-in-line with the service piping, and completely unobstructed. There are no moving parts in contact with the lading fluid. Available in both natural and synthetic materials for every corrosive or abrasive service.

Complete details on this unique principle of control valving in slip-on, flanged, and air-motor operated types are available on request. Ask for **Bulletin 500**—*without obligation, of course.*

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IN CANADA

BRITISH COLUMBIA

★ **Van Roi Consolidated Mines Ltd.**, because of a labor shortage, has brought in skilled men from eastern Canada to step up development work and increase the milling rate at the company's new base metal operation near Silverton. Mill tonnage is expected to be up to 175 or 200 tons by June and will be raised to 250 tons when feasible.

★ Higher operating costs and a lower price for gold forced **Bralorne Mines Ltd.** to increase average grade of ore mined and to eliminate lower-grade ore during 1951 to maintain a net profit approximately the same as the previous year, according to the annual report of the Bridge River mine, the largest gold producer in B.C. Net profit in 1951, before depletion, was $505,650, compared with $507,513 in 1950. Tonnage of ore milled was 9% lower and operating costs 13% higher, while average price received for gold was $38.05 per oz. in 1950 and $36.85 in 1951.

★ **Consolidated Mining & Smelting Co.** reports its 8,500 employees last year set a record in safety for the 46-year history of the company, with only 17.5 lost-time accidents per million man-hours worked. Employees worked 17-million man-hours with a total of 297 lost-time accidents (104 less than 1950), a 26% improvement.

★ Forty-one aluminum transmission towers will be used in the 50-mi. power line from Kemano power house to **Alcan's aluminum smelter** at Kitimat. The towers, to be built at a cost of $800,000 by Yarrows Ltd., at Victoria, B.C., will be used in portions of the line crossing difficult terrain and will be flown in by helicopter. Steel towers will be used in other portions.

★ **Sil-Van Consolidated Mining & Milling Co. Ltd.** plans first production from its new 150-ton daily capacity mill by Nov. 1 this year. Crushing plant will be housed in the former Duthrie mill building, on the company's property on Hudson Bay Mountain, near Smithers, and an extension will be built for grinding and flotation units. Gold, silver, lead, zinc and some copper will be produced by the firm's operations. Total expenditure to production stage will be approximately $1-million.

★ At the Columbia Lead and Zinc property, near Revelstoke, a mill site has been located immediately below the lowest adit level, according to **Columinda Metals Corp.**, which recently took over the mine. A diesel locomotive and power plant have been purchased, considerable mill equipment is on the property, and a jaw crusher and compressor are on order.

NOVA SCOTIA

★Nova Scotia for the first time in generations has a base metal mine, **Mindamar Metals Corp.** having started its 500-ton mill late last month. Financed by Dome Mines and brought back to life by higher metal prices, Mindamar (Sterling area, Cape Breton Island) appears to have a profitable future assured. Zinc concentrates are protected by a four-year contract with the British Government, while copper-lead concentrates have been sold for two years in advance. Most important item of news, however, is that recent surface drilling along the main zone on strike to the northeast has added impressively to ore reserves. The present total of 780,000 tons might even be doubled by the new discoveries.

★**Barymin Co.**, Canada's leading barite producer, operated close to capacity all year. Only shortage of shipping prevented sales from rising even higher. The mine is situated at Pembroke, Hants County.

ONTARIO

★Ore potential of **Steep Rock Iron Mines** (Steep Rock Lake, Northwestern Ontario) is now estimated at a minimum of 500-million tons per 1,000 ft. of depth, and foreseeable output is 10-million tons of iron ore annually to be reached well before 1960. Most of the output will come from the Errington and Hogarth mines. The former, now an open pit operation but soon to be mining from underground, is the sole source of production at present, while the Hogarth will be under the scene of the present big dredging operation which is draining the west arm of Steep Rock Lake. Production in 1951 set a new record at 1.3-million tons.

★International Nickel Company of Canada has almost a quarter of a century's ore reserve in sight (253-million tons). The company spent $2.5-million in outside exploration last year. Exploratory drilling in five Canadian provinces totaled 290,000 ft., and outside of Canada, Inco prospectors and geologists worked in eight different countries.

★Record earnings of more than $3-million were shown last year by Falconbridge Nickel Mines. Feature of recent operations, however, has been the finding of a new orebody at the Levack mine, on the northwest rim of the Sudbury basin. Though only five holes have been drilled, at least 3.5-million tons is indicated in the new show, with grade higher than Falconbridge average.

★Shaft-sinking has started at the property of **Milnet Mines**, formed during the winter to develop the two nickel-copper orebodies developed by Jonsmith Mines in Parkin Twp., Sudbury area. It will go to 400 ft., to open two levels. The company will not

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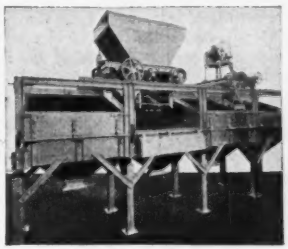

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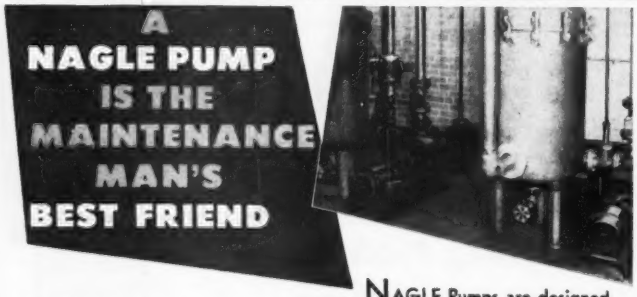
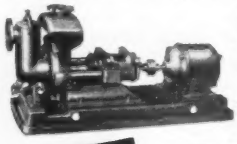


NAGLE Pumps are designed to eliminate shut-downs and maintenance. The 2½" type "AW" self-priming pumps shown feature an easy-to-clean basket strainer, clamp-on quick-off end plate, readily accessible stuffing box, fast sleeve type slippage seal adjustment and split-bearing stand—top half lifts off. Pump can be rapidly dismantled. Variety of drives. *Water end parts of the* corrosion resistant alloy best suited to your needs. No wonder more and more chemical plants are standardizing on Nagles. A wide range of horizontal and vertical shaft pumps — ALL for corrosive and abrasive applications. Get the facts!



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PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

Ontario *(Continued)*

install a mill, but will ship ore to Falconbridge. A rate of 250 tons daily is visualized.

MANITOBA

★**Hudson Bay Mining & Smelting Co.** reports a net income for 1951 totaling $17,710,274 compared with $15,250,170 in 1950. Higher metal prices and increased production of zinc accounted for the record earnings. Output in 1951 was comprised of 83,335,358 lb. copper, 109,369,500 lb. zinc, 144,470 oz. of gold, and 1,956,948 oz. of silver.

★The three compartment shaft being sunk by Hudson Bay Exploration & Development Co., on the **North Star property** at Thompson Lake, will be used also for the investigation of the adjoining Don Juan Mines Ltd., newly incorporated in Manitoba.

★**Sherritt Gordon Mines** expects to move 20,000 tons of material to Lynn Lake on schedule by the end of the winter freighting season. The installation of turbines and generators at the power site will be completed by next fall. The railway right of way has been cleared for 55 mi. and the grade has been extended 11 mi. from Sherridon.

Underground work at Lynn Lake is being confined to completion of scram drifts, ore passes, and loading pockets. Construction of the leaching plant at Fort Saskatchewan, Alberta, will commence soon.

★**International Nickel Co. Ltd.** is freighting in 300 tons of supplies and equipment to explore its Ferguson River concession 125 mi. east of Rankin Inlet on Hudson Bay. The Company was granted rights on the 500-sq. mi. concession in 1950. Exploration work during 1951 confirmed the presence of nickel bearing zones.

★**Falconbridge Nickel Mines Ltd.** are carrying out a program of diamond drilling on the properties of the Maskwa Nickel Chrome Mines Ltd. in the Bird River area of southeastern Manitoba.

QUEBEC

★Exploratory drilling on the new bottom level at the property of **East Malartic Mines** promises better things for the future of this 14-year-old gold producer. Three holes fanned out from the crosscut gave widths up to 150 ft. grading somewhat better than mine average, with volume of at least 4,000 tons per vertical ft. indicated. The new 16th level is at 2,485-ft. depth.

★Also in the Barraute area, **Frebert Mines** has reviewed the results of its drilling, with an estimate of 697,000 tons averaging 3.58 oz. of silver and

2.84% zinc per ton, and a potential of 900 tons per vertical ft. to a depth of 775 ft. The property adjoins that of Pershcourt Goldfields on the west, and the drilling is on the same zone as that of Pershcourt and Barvue.

★**Elder Mines**, gold producer in the Noranda area, showed increased output and earnings in 1951, with production of $1,003,389 from 145,600 tons milled, and net profits of $182,603. The improved showing enabled the company to pay its first dividend, 2¢ per share.

★**Quebec Copper Corp.** is going underground. Work is being started on a three-compartment shaft which will be carried to at least 850 and perhaps 1,000 ft. Drilling last year on this revived property (idle these many years) in Quebec's Eastern Townships outlined some ½-million tons of ore to a depth of 1,000 ft. with copper content about 2%. First level will be at 400 ft. (former operators having mined out the ore above that horizon) with subsequent levels at 150-ft. intervals. The company is being financed by East Sullivan Mines.

★Another Eastern Townships property to approach the production stage is that of **Weedon Pyrite and Copper Corp.**, 39 mi. northeast of Sherbrooke. Finances have been raised by way of a $600,000 note issue for a 250-ton concentrator from which concentrates should start to flow early next fall.

Weedon was a profitable producer away back in World War I days, but lay idle for the past couple of decades until last year when the stimulus of higher metal prices revived it. Close to 400,000 tons of ore is estimated to be available. Average grade is 2% copper, 30% sulphur, with one section carrying low values in zinc as well.

★**In the Dore Lake section** of Chibougamau, some 30 mi. from Opemiska, Jaculet Mines has resumed drilling, and Obalski Mines has just completed a magnetometer survey and is planning to drill.

★Possibilities of a nickel-zinc operation for Quebec are seen at the property of **Eastern Metals Corp.**, 65 mi. southwest of Quebec City. Surface drilling last fall indicated 825,000 tons with an average content of 0.81% nickel and 1.32% zinc. Funds have been raised for a three-compartment shaft to be sunk 600 ft. initially.

IN LATIN AMERICA

★**The Mining Association of Chile** is expected to recommend the following legislation governing mining of radioactive minerals to the Chilean Government:

1. The state is to have sole right to prospect and stake claims on unstaked grounds. Only the government will be permitted to mine minerals found in such ground.

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Latin America (*Continued*)

2. Mine owners will have the right to exploit radioactive minerals found on claims staked and surveyed previous to the passing of the new law now being put through Congress.

3. Only the state will be permitted to buy and sell uranium and other radioactive minerals.

★**The Chilean Mining Bank** will build a 30-ton flotation and cyanidation gold mill to handle ores near the town of Illapel in southern Coquimbo.

★Orders for 560 gondola type, 100-ton ore cars and 66 miscellaneous cars have been placed with Magor Car Export Corp. by **Orinoco Mining Co.** to transport iron ore in Venezuela. Orinoco Mining has also placed orders for nine 1,600-hp., 180-ton road switcher type diesel electric locomotives with Baldwin-Lima-Hamilton Corp., and has ordered one 250-ton diesel wrecking crane from Industrial Brownhoist Corp.

★**Cleveland Cliffs** has set up a corporation called the Diana Corp. to handle activity in Venezuela. This new corporation has acquired options to purchase considerable acreage in the Sucre district in the State of Bolivar about 60 mi. west of U. S. Steel holdings.

★**Cerro de Pasco Corp.** celebrated its 50th anniversary in Lima, Peru, during the last week in February. The company plans to invest between $24-million and $30-million during the next four years principally for the new electrolytic zinc plant and the Paucartambo hydroelectric unit, both of which are now being built.

★**Volcan Mines Co.**, with properties at Ticlio, in Central Peru, has started to build a 350-ton lead-zinc concentrator.

★**Compañia Minera Canza**, owned by Mauricio Hochschild & Co., has installed a 100-ton copper concentrating plant.

★**Compañia Minera Santo Toribio** is erecting an 80-ton mill to concentrate silver-zinc ores. The company's properties are in the Huaraz region, inland from the port of Chibote, in northern Peru.

★Estimates of **potential Brazilian exports** of minerals for 1952 are tabulated below. The list was prepared in connection with recent legislation to give Brazil absolute control over the export of any minerals which might be declared of "strategic importance."

Mineral	Metric Tons
Iron ore	2,000,000
Manganese ore	600,000
Tungsten ore	2,000
Beryllium ore	3,500
Tantalite (High grade)	150
Columbite	50
Ilmenite	30,000
Rutile	1,500
Baddeleyite (Zircon)	10,000
Zirconite	5,000
Monazite	5,000
Mica, blocks, split	1,000
Quartz crystals	1,000

★Construction of a **220-kilometer railway** connecting ICOMI manganese deposits in Amapa Territory with Macapa on the Amazon River is scheduled to begin about mid 1952. ICOMI stands for Induria e Comercio de Minerios S.A., a joint U. S.-Brazilian company which has $35-million in World Bank funds to spend.

★**Mexico's mineral production** for the last two years in metric tons was as follows:

Product	1951	1950
Gold	12.237	12.693
Silver	1,352.262	1,528.470
Copper	61,701	67,351
Lead	225,468	238,078
Zinc	180,064	220,634
Antimony	6,825	5,867
Mercury	279	128
Arsenic	12,762	8,987
Iron	312,581	285,738
Tungsten (WO_3)	193	40
Manganese	28,524	14,461
Graphite	33,286	22,627

★Mexico exported 16,059 tons of fluorspar to the United States in January, 1952.

★The Bank of Mexico made its third shipment of silver since last December to Western Germany, 700 bars worth $519,000.

★**Semi-official sources expect Mexico's**

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1952 sulphur production to exceed the 1951 output totaling about 54,000 tons. Last year 50,642 tons were allotted Mexican industries; 9,000 tons, exported (raw); and 6,815 tons (refined) were imported.

★The Confederation of Chambers of Commerce foresees doubling of Mexico's current **300,000-ton steel output** by 1954. This bullishness is based upon important iron deposits recently found in Durango and Coahuila, plus the fact that new methods of treating iron ore will permit the use of Mexican coal instead of coke.

IN EUROPE

★**Output of Turkish quicksilver** will be increased soon through the formation of a new company to mine the deposits near Konya more fully. Present output from this quicksilver deposit is about 1,000 kilos (98 to 99%) per year. Austria recently received a first installment of 400 kilos of Turkish quicksilver at $5.30 per kilo. However the Turkish Government has now set a minimum price of $7 to $7.50 per kilo f.o.b. Istanbul. This will virtually prevent exports here because quicksilver is being offered in Spain for $6.50 per kilo. It is estimated that about 2,000 kilos of quicksilver are now being held privately in Turkey.

★Recent reports show that **Spain's production of wolfram** totaled 759 tons in 1950 as compared with 4,038 tons in 1943. Of the 759 tons, 717 were exported, 306 going to Austria and 240 tons to Sweden. This large shipment of wolfram to countries which had no direct use for the materials gave ground to rumors that Sweden and Austria were acting as intermediary purchasing agents for Russia. As a result of measures taken by the U.S., these exports have ceased, and Spain's actual wolfram output, now calculated to be about 150 tons per month, is going to the U.S.

★**Sandviken iron works** has started a sponge iron plant to increase steel production. The plant is using the Wiberg sponge iron process. Production is estimated to be 20,000 tons a year. Four other sponge iron plants are planned in other parts of Sweden.

★**Austrian mine production in 1951** was as follows: iron ore, 2,369,672 tons; copper ore, 84,168 tons; lead and zinc ore, 105,518 tons; magnesite, 664,789 tons; graphite, 18,422 tons.

★**The Sydvaranger iron mines** have now been rebuilt after wartime destruction at a cost of more than £7-million. Production was scheduled to begin in April at a rate of 1-million tons per year, nearly all for export.

★**A major invention** that might be revolutionary in the bort market has been devised by Siegfried Roos of the diamond trading firm I. Komkommer & Son, Amsterdam. This invention is said to reclaim 86% of the bort which had heretofore been lost in diamond cutting and polishing operations. The bort is recovered electrostatically. With this invention it is estimated that Holland could cut out the 75,000 carats of bort which it imports annually.

★**A rich deposit of giobertite** ($MgCO_3$) is reported to have been discovered at Urepel, in the French Pyrenees, about a mile across the border from Spain. The deposit is about 150 meters long and 800 meters deep. It will be worked by a group of French interests including Societe des Refractaires de Valenciennes. A $457,000 refining plant is planned.

★**A large lead and zinc combine** is being organized at Olkusz, according to Polish sources. The project will involve lead and zinc smelters, and a large zinc ore mining installation.

★**Persistent rumors in Spain** indicate that the Spanish Government is considering repurchase of the Rio Tinto mines from the British company which bought it in 1873 for 92-million pesetas. Rio Tinto is Spain's largest producer of copper pyrites. Rio Tinto offices flatly deny reports about the repurchase, and state that they have no knowledge of such a proposal.

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Europe *(Continued)*

★**SFIOR, an Italian company,** will have exclusive rights to work phosphates in Jordan for a 60-year period, as a result of negotiations which have recently taken place at Amman. Royalties to be paid the government of Jordan are reported to be £2 sterling per ton of phosphate mined. Estimated output will be 300,000 tons per year during the first two years, and in the third year output should rise to 600,000 tons. Initial capital of SFIOR is to be £1-million sterling. If the company should later become nationalized, "adequate compensation" will be made.

★**Italy's production** for the first 10 months of 1950 as compared with the same period in 1951 changed as follows: zinc, 31,000 to 39,000 tons; lead, approximately 23,000 to 26,500 tons; aluminum and aluminum alloys for semi-manufactures, 24,700 to 31,000 tons; copper for semi-manufactures, 38,000 to 46,000 tons; brass semi-manufactures 37,000 to 41,000 tons; semi-manufactures of lead, 16,000 to 20,000 tons; semi-manufactures of zinc, 6,600 to 7,600 tons. Value of metals exported for the 10-month 1951 period totaled $12-million, of which $6.6-million was for aluminum, and the balance almost entirely for zinc.

Italy is now planning a new iron and steel industry with greatest interest centered in the rich iron ore deposits in Sardinia. ASSIDER (Italian Iron and Steel Manufacturers' Association) investigated possible sources of iron ore, and arrived at the following conclusions: The Nurra field (Sassari) has reserves of about 2.5-million tons. The Aritzo-Gadoni field (Nuoro) has some good prospects and about 1-million tons of magnetite are already available in the Giaccurru field. Total resources are estimated to be about 10-million tons. The Salaponi-Nueddas field near Gonnoslanadiga (Cagliari) contains important deposits of limonite ore. Some high-grade ore has been found in the Iglesiente and Fluminese fields. The Monte Picci area of the San Leone field can supply about 3-million tons of magnetite, and total resources in this field are estimated at 6 to 7-million tons.

The Mining Board has granted the Montecantini and the Ferromin companies permission to prospect for and mine iron ores and pyrites on the Isle of Elba.

with a

SAUERMAN SCRAPER

(Above) Storage and rehandling of thousands of tons of phosphate rock at large processing plant is accomplished by two Sauerman Drag Scraper units of medium size. Machine in foreground has its hoist mounted on a flat car, while the machine on opposite side of track uses a high head tower.

Whether the storage area is small or large—indoors or outdoors—whether the material is light or heavy—there is a type and size of Sauerman Drag Scraper to solve the problem and cut handling costs to rock bottom. The Sauerman method is faster and more efficient because its operation is continuous and automatic—all under the finger-tip control of a single operator. The unique Crescent bottomless bucket quickly loads to capacity—slides smoothly over the top of the material being handled—completely empties as it's pulled backward.

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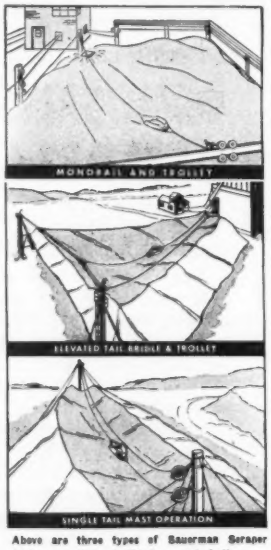

Above are three types of Sauerman Scraper Systems used to build larger stockpiles.

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IN AFRICA

★**The value of Northern Rhodesia's mineral output** in 1951 totaled more than $195-million. Electrolytic copper production was 103,146 tons, valued at more than $58-million. Blister copper production was 205,996 tons, valued at more than $111-million. Zinc output was 22,590 tons valued at $15-million; lead 13,970 tons, valued at $6.35-million; and cobalt alloy, 36,726 tons, valued at $3.95-million.

★**Union of South Africa mineral production** for 1951 was worth nearly $590-million, of which gold accounted for $420-million. Diamond production of 2,229,000 metric carats was valued at more than $45-million; asbestos, 111,296 tons, valued at $15-million; and antimony, 28,211 tons, valued at $11-million.

★**Forty Sherman tanks** are now being used to remove huge sand dunes overlying diamond deposits at the mouth of the Orange River in Southwest Africa. Consolidated Diamond company's operations here are producing about 500,000 carats of diamonds per year, requiring the removal of 6-million tons of ground per year.

★**The No. 1 Shaft at Freddies North,** in the Orange Free State, believed to be the world's largest, has been completed. Final depth is 5,973 ft. Area of shaft is 14x50 ft. Twelve miles of steel guides and 7.5 mi. of piping have been installed in the shaft.

★**No. 1 Shaft Virginia, O.F.S.,** has intersected the Leader-Basal reef at a depth of 3,756 ft., assaying 6.33 dwt. over a channel width of 53.7 in., equal to 340 in.-dwt. All three shafts on the property are now on the reef

horizon, and work is being concentrated on connecting the shafts. They expect to pour the first bar of gold this year.

★**Uranium production** by the South African gold mining industry is to start earlier than originally scheduled, and will be on a scale three times as large as that planned in 1950. West Rand Cons. is expected to start production during May, instead of the last half of 1952 as originally anticipated. Similar rapid progress is under way at three other large producers and two potential producers. Orange Free State gold producers will also come under this uranium producing plan.

Interesting work has been done on the Upper Witwatersrand sediments which contain the Elsburg, the Gold Estates, the Leader Basal, where a close correlation has been found to exist between the gold and uranium content. A **special geiger counter** suspended by steel piano wire is lowered into boreholes to obtain radiometric logs. A 6,300-cycle carrier current is modulated by pulses of the geiger counter in the probe unit, while the signal from the pick-up is transmitted up the wire using the earth as the return circuit. Only gamma radiation is picked up by this unit because the steel case shields softer radiation. Dr. D. J. Simpson, of the Union's National Physical Laboratory, is in charge of the investigations. Thus far logging has revealed that there are definite cycles of uranium deposition which can be correlated over great distances.

IN AUSTRALIA

★Under Australia's newly introduced **import policy,** modern mining machinery which has to come from abroad, will still be admitted. Building materials for construction, however, may be cut. This might effect prefabricated housing programs of some mines.

★**All mining centers** in Australia report an improved manpower situation. Cuts in public works and some recession in secondary industry have shunted labor into the mining field.

★One effect of the general uneasiness in Australia's economy is a renewed interest in gold mining. Successful **sales of gold in "premium" markets** are behind this confidence in gold mining companies.

★The Lead-Zinc Wages Board of Tasmania has **granted 30% marginal wage** increases for employees in Tasmanian lead and zinc mines. Electrolytic zinc workers received a similar increase.

★**Ajax Consolidated N.L.** will undertake large-scale wolfram production at its Womobi mine near Granya in Victoria. Six known reefs extend for a length of 1,200 ft. The company has been offered long-term contracts assuring world parity top prices, with provision for an economic floor price.

★**Central Victoria Dredging Co. N.L.** worked 1,297,440 yd. yielding 6,043 oz. of gold during the 40 weeks ending Jan. 1 at the Jim Crow dredge.

★**King Island Scheelite** (1947) Ltd., operating on King Island, Tasmania, milled 163,710 tons of crude ore averaging 0.55% WO_3. Production for 1951 was 973 tons of scheelite concentrates, the average grade of which was 61.6% WO_3. Ore reserves on Oct. 31, 1951, were estimated at 2,465,736 tons.

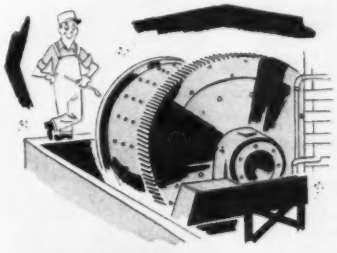
Sales were made during the year of 734.5 tons of scheelite concentrates, averaging 64.15% WO_3. The average sale price in 1951 was £31 18s. 11d. per (long ton) unit, as against £8 15s. 11d. per unit in 1950.

The new Vanner retreatment section, construction of which started in August, 1950, was completed in May, 1951. Production, included with the mill concentrates forwarded overseas, totaled 8,053 units in a concentrate assaying 48.8% WO_3.

The throughput of the mill is being increased by 50% so as to provide for the increased output required under the company's contracts. Additional production is scheduled for May of the current year.

Canadian MINING ON THE MARCH

The primitive stamp mill crushed ore in banks of mortars by pounding it with mechanical pestles. The stamp mill was succeeded by the forerunner of the ball mill—large drums containing ore and water, in which flint-like imported Danish pebbles ground the ore as the drums rotated.



In the modern ball mill, grinding is done by cast or forged steel balls in huge rotating drums with a central opening at each end. Water flowing through carries pulverized particles to the classifier, which passes finest material on to next process, returns insufficiently ground ore to the ball mill.

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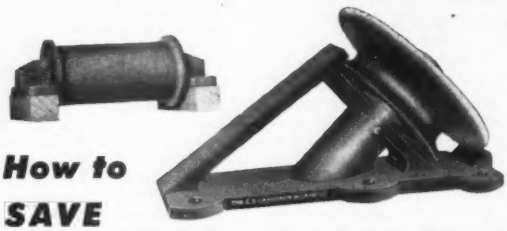

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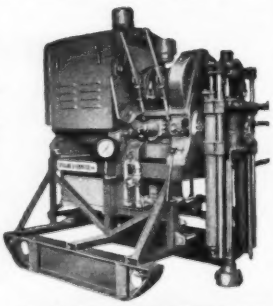

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See our four-page insert in the Mining Catalogs

Australia *(Continued)*

★**At least one large producer of copper** in New South Wales threatens to close down because of high costs and the low domestic price for copper. The federal government is investigating means of helping copper producers. Paringa Mining and Exploration Co., Ltd., has taken an option for the Fortune Extended lead mine at Northampton, one of Western Australia's biggest lead areas. If this option is exercised, production will be about 300 tons of lead concentrates a month.

★**Wolfram production** in the Northern Territory has almost doubled in the six months ending Dec. 31, 1951.

★The federal government will contribute an additional £4,250,000 to develop the **aluminum plant at Bell Bay**, Tasmania, which is expected to produce 15,000 tons of aluminum per year. The greater part of the loan will be used for power production.

IN THE PHILIPPINES

★A new gold producer was added to the list of Philippine gold mines in February when **Baguio Gold** reported production of $47,300 for the month from 6,000 tons milled. The mine was an important prewar producer.

★**Copper production** in the Philippines for 1951 was valued at P 14,987,533 ($7,493,700 at the statutory rate) which compares with a value of P 8,254,164 in 1950. Of the 1951 total, Lepanto Consolidated accounted for 98%. Hixbar Mining Co. on Rapu-Rapu Island supplied the small balance. For the first two months of 1952 Lepanto milled 66,286 tons of copper-gold ore, valued at P 3,923,000.

★The Philippine Iron Mines operating at Larap in south central Luzon reported a net profit of P 1,500,000 in 1951.

★**Benguet Consolidated** reported that the combined tonnage from Benguet and Balatoc treated at the central mill of the two companies in 1951 totaled 876,523 tons, an increase of 20.6% over the 727,037 tons milled in 1950. From this tonnage 194,809 oz. of gold were obtained, an increase of 40,410 oz. or 26% over 1950. Gold recovery from the Benguet operation averaged $8.24 per ton from ore with an average grade of $8.72, indicating a recovery of 94.5%. Gold recovery at Balatoc was considerably lower. The combined average recovery was 90.69% or $7.77 per ton milled on ore that averaged $8.56 per ton mill heads.

It was further disclosed that mill construction is proceeding to an ultimate objective of 4,000 tons per day. By the middle of 1952 it is expected that milling capacity will be up to

2,800 tons per day, or 400 tons more than the present daily rate.

Ore reserves at both Benguet and Balatoc were well maintained during the year and totaled 4,540,330 tons at the end of 1951, compared with 4,451,161 tons at the end of 1950. Average grade of reserves was about $8.73 per ton at the statutory price.

★During 1951 **Atok Big Wedge** milled 171,291 tons of $9.94 ore. More ore was milled than in any previous year but the grade steadily declined. Gold recovery improved to over 95%. The ore reserve position deteriorated during the year, declining to 391,177 tons of $7.72 average grade ore, contrasted with 433,803 tons of $9.50 ore at the end of 1950. The company realized a net profit in 1951 after taxes of $668,090. Announcement has been made that Edward Wisser was engaged to examine the mine in 1952.

★Under the terms of a new minimum wage law passed in 1951, by the Philippine legislature, the mining companies will be obliged to hike wages another 50¢ per shift, bringing the minimum wage to $2, effective August, 1952. Unless ameliorated by lower supply costs or eased taxation, operating profits at the mines will suffer accordingly. To add to the uneasiness of the gold operators the price of gold in the open market has been declining and fell to P 110 an oz. at the end of March. Buyers have been driven out of the market by nuisance raids of government agents, although the government has given approval for sales of 75% of the mines' output on the open market, provided 25% is turned into the Central Bank at the statutory price.

Detonating Fuse

(*Continued from page 100*)

detonation of long small-diameter columns of dynamite and to avoid "cut-offs" of the dynamite in seamy ground or where millisecond delay electric blasting caps are used.

2. For "ring-hole" blasting—This detonating fuse is often used in radial or ring-drilled holes to insure complete detonation of the entire column of dynamite, especially where the length of the radial drill holes varies considerably.

3. Pillar blasting—Primacord is often used to blast out groups of pillars in worked-out areas of the mine.

4. Post or timber set blasting—It is often used to blast out timbers in worked-out portions of the mine.

5. Chute-starting — In conjunction with a "bomb" made up of several cartridges of dynamite, it is often used for chute-starting.

6. Block-holing in stopes, in chutes or on grizzlies—It is frequently used to blast simultaneously large chunks of ore that have "hung up" in stopes, lodged in chutes or have blocked the grizzlies.

TROUBLED WITH CLOGGED SUCTION LINES?
in flotation system
In MORRIS
Type R Slurry Pumps
SUCTION LIFT HELPS REMOVE OBSTRUCTIONS!
A Morris Type R is capable of operating under suction lift . . . positive head not required! This design feature lets atmospheric pressure do its work — and in many instances it's sufficient to clear the stoppage. Shutdowns and dismantling of pipe lines are greatly reduced.
And when there are cases calling for pump dismantling, the job is relatively simple with Morris Type R. By loosening four bolts, off comes the end cover — and you can take a quick look at the inside. Unscrew the impeller, if necessary. But you don't have to disturb the pipe line at all.
Small wonder Morris Type R is so popular. Flow is maintained so reliably throughout the range from heavy slurries to foaming slurries, that a lot of operating problems are answered. Get the full story of this many-feature pump. Write for Bulletin 181.
MORRIS MACHINE WORKS Baldwinsville, N.Y.
Branch Offices in Principal Cities
MORRIS
Centrifugal Pumps

Grandpa Never Threw a Thing Away

It's only human to want to hold on to things after they've outlived their usefulness. That's why today millions of tons of worn-out and obsolete equipment and machinery are lying forgotten in the country's plants and factories and on farms.

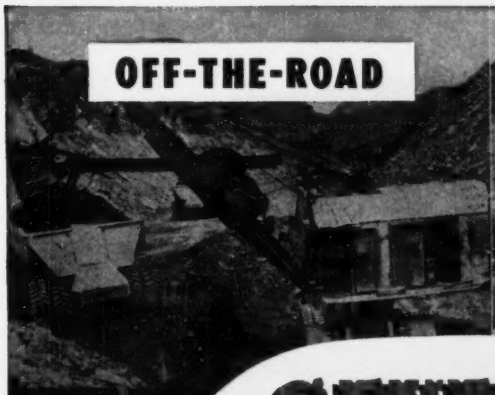
The steel industry needs these millions of tons of dormant scrap, needs it in the worst way. With this vital dormant scrap the entire steel supply picture would brighten up, with more steel for everybody. But without it, the steel industry cannot hope to keep up production at present levels.

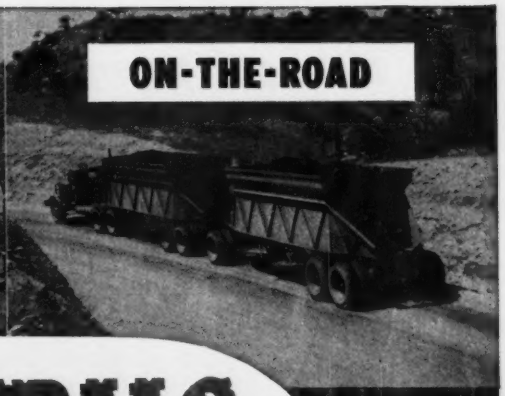
Call in a scrap dealer now, today. He will buy your dormant scrap and start it moving toward the steel mills.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

More Scrap Today... More Steel Tomorrow





GENERALS

Resist cuts, scrapes, bruises... Give more traction! More speed! More safety—

WORK FASTER... LAST LONGER... COST LESS

more profit for you per job!

GENERAL L. C. M. Broad, deep, self-cleaning tread lugs and reinforced shoulders for more traction off-the-road. Longer wear on razor sharp mine and quarry surfaces.

GENERAL H. C. T. for most work on-the-road, some off. More rubber, more cords per inch for greater safety. Extra traction through sand, gravel, slush, mud.

THE GENERAL L.C.M.

THE GENERAL H.C.T.

GENERAL UNDERGROUND MINING TIRE

Extra strong, extra thick rubber at the shoulders. Resists cuts, snags, bruises. More traction. More wear.

REQUEST GENERAL TIRES ON YOUR NEW EQUIPMENT

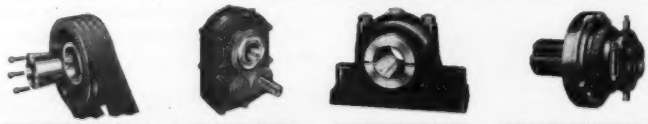
- The pulley for *modern* belt conveyors.
- Drum type construction provides maximum strength with minimum weight.
- Interchangeable hubs simplify installation, positioning, removal — insure better conveyors at *less* cost.
- Accurately formed. Uniform rim thickness. Fully enclosed — to exclude dust, dirt, water.
- Diameters 6 in. to 8 ft., all face widths. Popular sizes stocked by our distributors.

DODGE
of Mishawaka, Ind.

DODGE MANUFACTURING CORPORATION
3100 Union Street, Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified telephone directory.

FIRST IN POWER TRANSMISSION MACHINERY!



V-BELTS AND TAPER-LOCK SHEAVES | TORQUE-ARM SPEED REDUCERS | DODGE-TIMKEN PILLOW BLOCKS | ROLLING GRIP AND DIAMOND B CLUTCHES

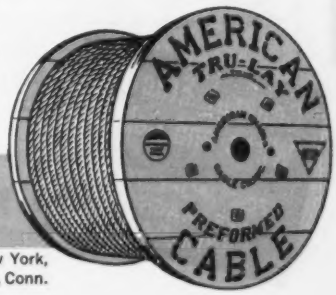
an ACCO product

TRU-LAY Preformed WIRE ROPE

● For each use there is *one best* wire rope . . . one that will stand repeated loading, abrasion, crushing, or continuous bending, and be the best rope to buy.

To achieve this, there is a TRU-LAY Preformed Wire Rope made in a special construction for your equipment. This construction has the exactly right combination of strength, bending life, and resistance to wear and crushing that you need.

The one best wire rope . . . TRU-LAY Preformed . . . will last you longer and cost less to use. Specify and get TRU-LAY Preformed improved plow steel—the rope identified by the Green Strand.



ACCO

TRADE MARK

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

MAKE THIS *Comparison*

Check these figures, and compare typical Geoprene values with ASTM requirements.

ORIGINAL	ASTM Requirements	Geoprene Typical Values
Tensile strength, lb/sq in.	1800	3000
Percent elongation	300	500
Set in 2-in. test piece, in.	3/8	1/16
After 7 days in Geer oven at 70 C		
Tensile strength, lb/sq in.	1600	2900
Percent elongation	250	430
After 96 hr in oxygen bomb at 70 C		
Tensile strength, lb/sq in.	1600	2800
Per cent elongation	250	430
After 18 hr in oil at 121 C		
Per cent depreciation in tensile strength	40	35
Per cent depreciation in elongation	40	35
Tear Test		
Tensile strength, min lb/in.	40**	75

**This is the requirement for rubber jackets; no tear value has yet been set for neoprene-type jackets.

General Electric Wires and Cables

FOR MORE TONS PER MACHINE PER DAY!

On the tough jobs—wherever you use portable tools or heavy equipment—specify tough, abrasion-resistant General Electric Geoprene cable. Geoprene's rugged neoprene-based jacket resists oils, acids, alkalies, sunlight, and flame. A tough, corded reinforcing mesh enables it to take the hauling and dragging that your job requires. Specify Geoprene cable. Let it convince you by on-the-job results that G-E Geoprene cable offers extra service, extra tons per dollar.

In the full line of General Electric wires and cables you'll find the cable you need. This famous line includes: G-E No. 1799 varnished-cambric insulated cables, Super Coronol* cable, wire armored cable, interlocked armor cable, aerial cables, and mine telephone cable . . . Flamenol* control wire and magnet wire.

Send for your free copy of the 24-page booklet, *General Electric Wire and Cable for the Mining Industry*. Section W29-595, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

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You can put your confidence in—

GENERAL ELECTRIC

RECLAIM WORN-OUT *Surface Material on* BITUMINOUS ROADS *with* HYSTER® Grid Roller

On this black top salvage job in California, Hyster Grid Roller and Caterpillar Motor Grader did in 10 HOURS what it would have taken 7 or 8 DAYS to do with old methods.

Saves 5 Ways

✓ **TIME** — The Grid Roller pulverizes old surface material, compacts road base and new surface courses faster and better than old-style methods and equipment.

✓ **MATERIAL** — On normal salvage, the Grid Roller provides sufficient mix from old material for laying down new surface.

✓ **BINDER** — Usable binder in salvaged material is exposed, thus often reducing new oil required from ¾ to ⅜ gal. per sq. yd.

✓ **EQUIPMENT** — The Grid Roller does triple duty — reclaims old mat, compacts base, rolls new surface courses.

✓ **LABOR** — One operator performs simultaneously the pulverizing and scarifying or blading operations. Faster road reclaiming also means less labor time on the job.

BITUMINOUS ROAD SALVAGE has been revolutionized by the Hyster Grid Roller. Now it is **economically possible** to salvage, rejuvenate and use the old, worn-out surface material for re-laying the new road surface.

The procedure: (1) SCARIFY or rip up the worn surface; (2) PULVERIZE—Grid Roller reduces chunks to original loose road mix; (3) PREPARE BASE — compact with the Grid Roller; (4) LAY DOWN new surface, using salvaged road mix material, and rolling out with Grid Roller; (5) TURN OVER TO TRAFFIC.

From coast to coast CITY, COUNTY, STATE, FEDERAL and PRIVATE ROADS are being reclaimed at great savings in time, oil, material, labor and equipment. The nature of the job determines whether the Grid Roller should be towed by a motor grader or tractor.

See your Caterpillar-Hyster dealer. Write for literature.

HYSTER COMPANY

2965 N. E. CLACKAMAS ST., PORTLAND 8, OREGON
1865 NORTH ADAMS STREET, PEORIA 1, ILLINOIS

Valuable dust recovery should pay its own way

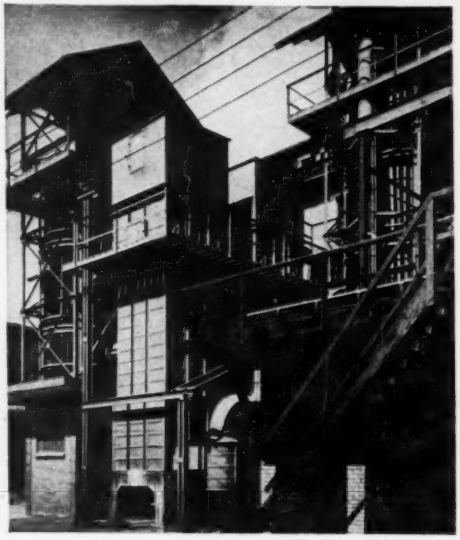
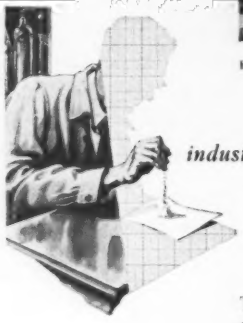


PHOTO BY C. E. ROSENBERG, A. R. P. S.

Buell 'SF' Mist Precipitator collecting Sulphuric Acid Mist.



A Buell industrial 'dust' man can show you how valuable dust recovery actually pays for itself in profits and plant efficiency.

The Buell organization of industrial 'dust' men is devoted solely to the design and construction of dust recovery and dust collection equipment that will most efficiently and economically solve your plant's specific stack dust problem.

For more than 18 years we have been doing just this for all American industry. Every Buell installation is a custom designed system, engineered to hold stack dust discharge down to the practical limits which assure new profits, improved product and/or process, better plant-community relations, higher levels of employee morale.

For full information about Buell's ***3 basic systems*** of dust collection, and how one can be applied to the solution of your stack dust problems, write today. Ask for the new informative bulletin titled, "The Collection and Recovery of Industrial Dusts." Do it now. Buell Engineering Co., Dept. 19-E, 70 Pine Street, New York 5, N. Y.

ELECTRIC CYCLONIC ®

HIGH EFFICIENCY CYCLONES • ELECTRIC PRECIPITATORS
TYPE 'LR' COLLECTORS • LOW DRAFT LOSS COLLECTORS
SPECIAL PURPOSE COLLECTORS • DUST HOPPER VALVES

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ENGINEERED EFFICIENCY IN **DUST RECOVERY**

"EUC" PERFORMANCE Pays Off

IN MINES and QUARRIES

"Eucs" are designed and built for moving coal, rock, ore, overburden and heavy excavation at the lowest cost. The simple but rugged construction of Euclids, combined with large capacity, ample power and speed, provide efficient off-the-highway hauling of practically any material.

Euclids are standard equipment in many leading open pit mines and quarries, and on construction and industrial work. Owners know that Euclid staying power and continuous operation result in more loads hauled in less time at lower cost.

Ask your Euclid distributor for data on quarry or open pit jobs similar to yours. There is a Euclid to meet your requirements for off-the-highway hauling work.

Rear-Dump Euclids—Capacity from 10 to 34 tons—diesel engines from 125 to 400 h.p., spring mounted or semi-rigid drive axles—top speed loaded up to 35.7 m.p.h.

MORE LOADS PER HOUR— MORE PROFIT PER LOAD

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

EUCLIDS *Move the Earth*

BASIC FEATURES
That Really Count!

Get them in the

MARION 111-M

1. Four cubic yard dipper capacity.
2. Electric swing on a diesel machine.
3. All-electric if desired.
4. Ships on two rail cars.
5. Ideal companion equipment of big haulage units.
6. Proven by 6 years in the field.
7. Smooth, fast Marion Air Control.
8. Dragline booms to 120 feet.
9. Dragline buckets to 5 cubic yards.
10. A Rated 161-Ton crane for the really big jobs.

MARION POWER SHOVEL CO.
MARION, OHIO, U. S. A.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

AMSCO dippers keep the heat on loading at 50° below zero

North Pole weather plus loading "pure rock" are no problems to Manganese steel dippers.

In June, 1948, an iron mine in the northwestern Adirondacks installed its first AMSCO dipper. It's still going strong—16 hours a day, 7 days a week! Old type dippers used previously lasted as little as one week. And the mining company had to employ four welders full time to keep them going.

In design, too, AMSCO dippers are made for the type of punishment low grade ore and low temperatures inflict. Except for tooth work, the only repair has been the replacement of the heel band after two-and-a-half years of this kind of vigorous operation.

Of course, not all mining and excavating operations are as tough as this one . . . but it's a good example of how to save money and manpower through the use of AMSCO products.

WHENEVER YOU MEET A PROBLEM OF WEAR CAUSED BY IMPACT AND/OR ABRASION . . .

. . . find out about longer-lasting, dollar saving AMSCO manganese steel . . . world's largest producer of Manganese Steel Castings for all industry.

AMSCO controls impact and abrasive wear in 5 basic industrial operations:

Brake Shoe AMERICAN MANGANESE STEEL DIVISION

376 EAST 14th STREET - CHICAGO HEIGHTS, ILL

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

"Carlon won't Corrode!"

"Amazing pipe, that CARLON! We've used it to handle wastes so corrosive they quickly eat through metallic pipe—but even after years of service, CARLON's as good as new. It just won't corrode!"

CARLON is the only pipe that is guaranteed against rot, rust and electrolytic corrosion. It features absolute resistance to the chemical attack of sulphurous waters, alkalies, and metallic salts. Permanent free-flow is assured by the smooth internal surface which will not accumulate scale or sediment.

CARLON plastic pipe is lightweight . . . flexible . . . can be installed quickly without special tools or rigging equipment. Furnished in long lengths which conform to irregular surface contours, it requires fewer fittings.

Recommended applications include drinking water and drainage systems, ventilating lines, hydraulic sluicing, intake and exhaust piping, dredge discharge lines, low-pressure air lines, etc.

NOM. SIZE	O.D.	I.D.	EST. BURST P.S.I.	WT. LBS. PER FT.	SHPG. LENGTHS
½"	0.840	0.622	540	0.103	400 ft. coils
¾"	1.050	0.824	350	0.140	400 ft. coils
1"	1.310	1.070	200	0.181	300 ft. coils
1¼"	1.660	1.380	200	0.267	300 ft. coils
1½"	1.900	1.610	200	0.320	250 ft. coils
2"	2.378	2.070	170	0.445	200 ft. coils
2½"	2.875	2.469	170	0.680	200 ft. coils
3"	3.504	3.070	165	0.910	100 ft. coils
4"	4.504	4.030	150	1.250	25 ft. str.
6"	6.630	6.070	115	2.230	25 ft. str.

Identification Stripe: WHITE—Standard Pipe
RED—Heavy-duty Pipe

CARLON CP 552-CP

Specify the Pipe with the Stripe!

Write for Catalogs

CARLON PRODUCTS CORPORATION

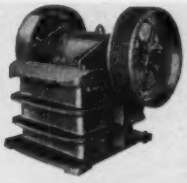
In Canada: Micro Plastics, Ltd., Acton, Ontario
10300 MEECH AVENUE • CLEVELAND 5, OHIO

Look To LIPPMANN *for*

Crushers, Screens, Conveyors

Lippman has specialized for 28 years in the design, construction and application of crushing, screening and conveying machinery. Today, the Lippmann name on a piece of equipment is recognized as assurance of consistent high production, low-cost performance and reliability . . . and leading producers prove it by repeat purchases of Lippmann machinery.

You, too, can look to Lippmann with confidence for the finest of equipment to meet your needs. A recent Lippmann development of particular interest to mines is a conveyor idler developed especially for hard mining service. It has the famous Lippmann life-sealed ball bearing construction and other features that make it the champion of conveyor idlers for tough mining use. Lippmann Engineering Works, 4623 West Mitchell Street, Milwaukee 14, Wis.

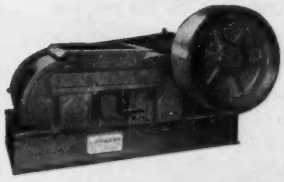


JAW CRUSHERS

Sizes up to 36 x 48 inches (the largest overhead eccentric jaw crusher made). Features 25% more crushing area, non-choking construction, maximum output, minimum power use and maintenance.

GYRATORY CRUSHERS

Revolutionary anti-friction gyratory operation with parallel shaft rotation results in lighter weight, less power consumption, reduced maintenance and controlled product size. Sizes 25 to 72 inches.



ROLL CRUSHERS

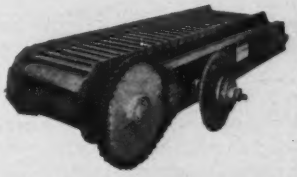
Offer real economy in secondary crushing. Exact product size control; tapered roller bearings; a variety of shell face patterns available; easily replaceable wear plates reduce maintenance. Sizes up to 72" x 24" rolls.

CONVEYORS

Complete line of both portable and stationary conveyors. Lippmann Life-Sealed ball bearing conveyor idlers are outstanding for lower first cost and maintenance. Ball bearings are lubricated for life.

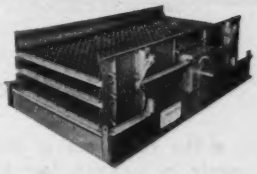
APRON FEEDERS

LIPPMANN makes apron feeders and plate feeders to meet all feeding requirements. Every design has been thoroughly proven by rigorous field service and built for long wear and low power requirements.



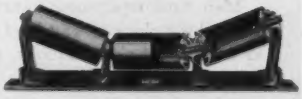
SCREENS

Vibrating screen pictured is positive eccentric type with equally distributed vibration for maximum capacity. Vibration contained in screen body entirely. All sizes, single and multi-deck.



CONVEYOR IDLERS—

This heavy duty conveyor idler is built specifically for hard mining service. It has the famous Lippmann Life-sealed ball bearings that are permanently lubricated and sealed against water, dirt and wear, plus shielded idler heads that shed dirt and water.



PULVERIZERS

An unusual design of hammer-type crusher with unmatched records of capacity, product size and quality control, low first-cost and ease of maintenance. Manganese hammers, forged hammer arms and other outstanding design features. Sizes up to 40" x 36".

LEW **LIPPMANN**

CRUSHERS FEEDERS SCREENS CONVEYORS ELEVATORS HOPPERS BINS

Portable Drainage Ditch for a Sunken Roadbed

● The rock floor of this limestone quarry, nearly a hundred feet below ground level, presents a constant drainage problem.

Men and equipment must be free to work around the clock in any kind of weather . . . free to work despite rain squalls, spring thaws or the gradual seepage of surface water through the overburden.

And, since the work location shifts as each load of stone is removed, the drainage facilities must be able to move with the shovels.

Getting the water off is a job for hose . . . a tough, flexible water carrier that can be dragged over abrasive surfaces, subjected to falling rock, snaked into out-of-the-way crevices and lengthened or shortened at the turn of a coupling.

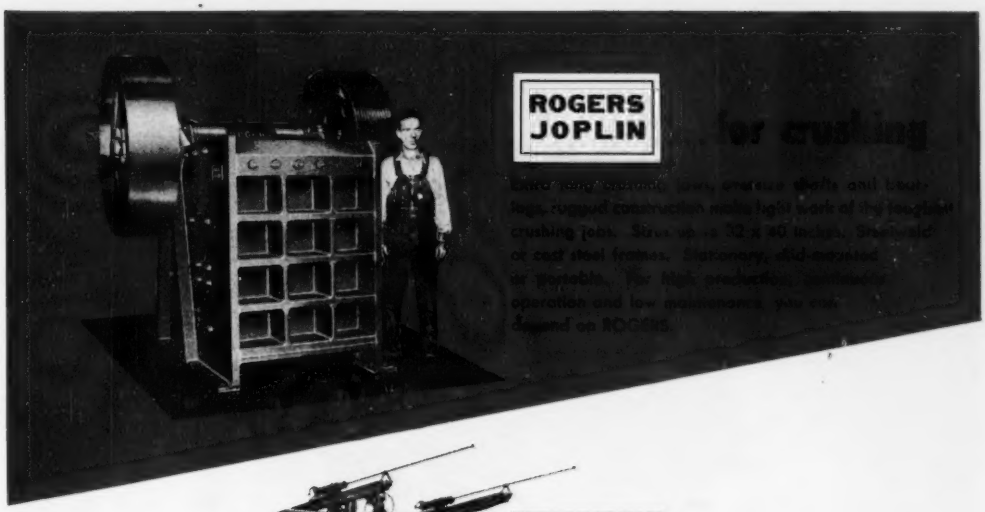
The Bessemer Limestone Company, a Republic Rubber customer for more than a generation, uses Republic's Water Hose for this purpose.

They use Republic Hose because it stands up better, handles easier, lasts longer on the job.

Water Hose is just one of Republic's complete line of Industrial Rubber Products that is quality built and sold through Republic Distributors who are experts in their job of helping you select and apply the right hose or belt for your specific job.

Your Republic Distributor is ready to make a complete, free analysis of your requirements now. Contact him or write us today for full facts on how this analysis results in better performance, better service and less costs for you on the job.

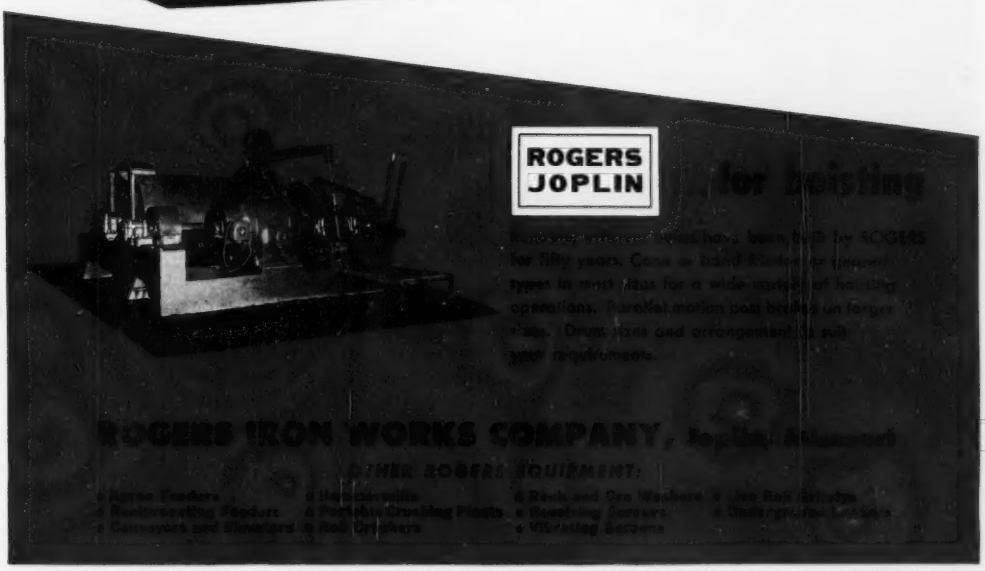
INDUSTRIAL RUBBER PRODUCTS BY
REPUBLIC RUBBER DIVISION
Lee Rubber & Tire Corporation
YOUNGSTOWN, OHIO



ROGERS JOPLIN

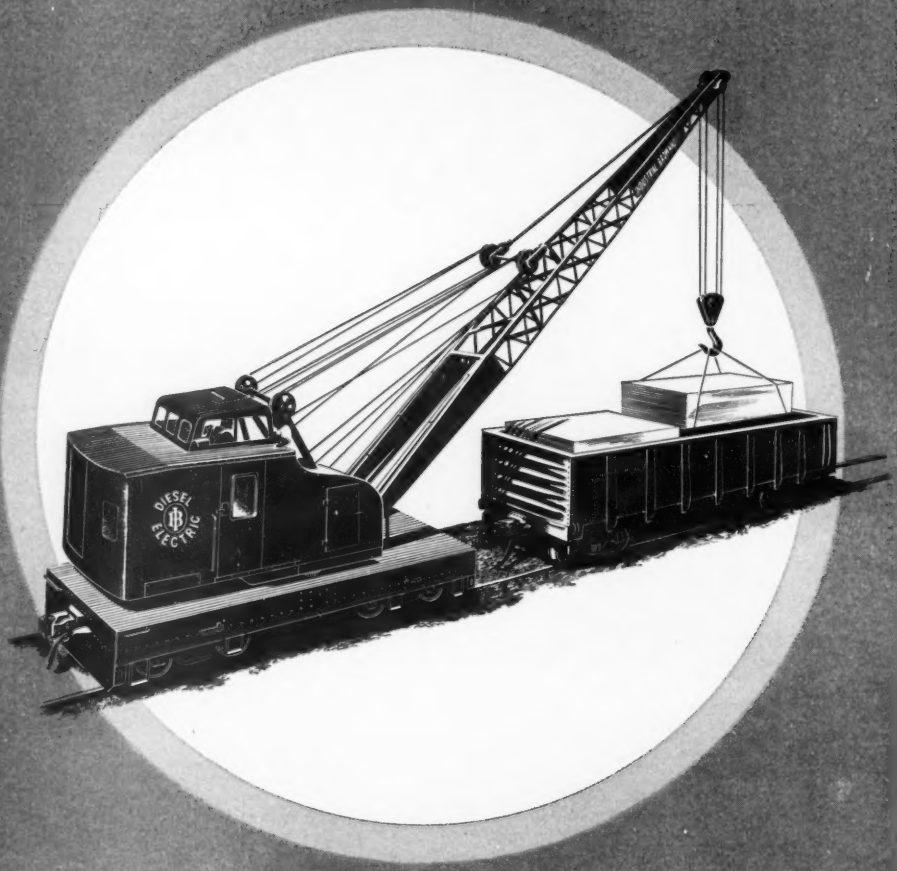
ROGERS JOPLIN ... for mining

There is a ROGERS custom designed jumbo to meet your needs. Crawler mounted stability, portable, flexible, completely self contained, automatic self-leveling operators' platforms, independently driven tracks. For drilling, powder loading, scaling, roof bolting, timbering to fifty foot elevations.



ROGERS JOPLIN

BROWNHOIST Diesel Electric Cranes save time, save labor, save money



Men who know cranes are quick to recognize the fact that Industrial Brownhoist Diesel Electric Locomotive-Cranes provide savings in man-hours, production time and money. Brownhoist Cranes, powerful, efficient units with high tractive power and rapid acceleration, give top performance as a switch engine or as a crane operating magnet, hook or bucket. The patented Monitor-Type Cab and Clear-Vision Boom permit unlimited 360° visibility that helps the operator safely turn out a greater volume of work. The simplified design and accessibility of the moving parts make Brownhoist Cranes easy to maintain and repair. Brownhoist builds Locomotive-Cranes in capacities from 25 to 80 tons.

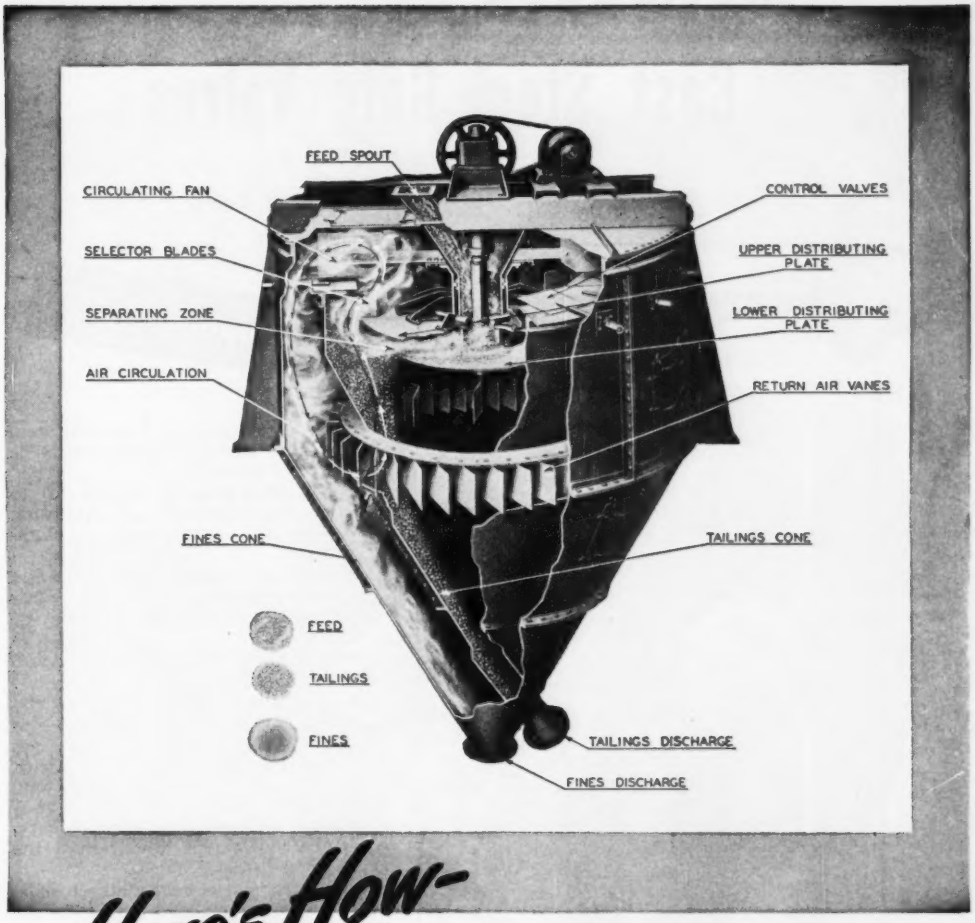
Write today for complete information.

155

BROWNHOIST
builds better cranes

CLAMSHELL BUCKET · 250 TON WRECKING CRANE · COAL-ORE BRIDGE · CAR DUMPER

INDUSTRIAL BROWNHOIST CORPORATION, BAY CITY, MICHIGAN · DISTRICT OFFICES: New York, Philadelphia, Cleveland, San Francisco, Chicago, Canadian Brownhoist, Ltd., Montreal, Quebec · AGENCIES: Detroit, Birmingham, Houston, Los Angeles



Here's How—

STURTEVANT AIR SEPARATORS

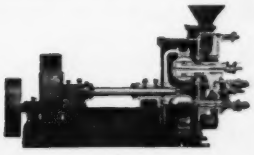
Produce accurate fines with increased output up to 300%

Exact regulation and control of centrifugal forces and air currents, one counteracting and overbalancing the other so precisely that by simple adjustments a product of almost any desired fineness is selected and collected, while coarser sizes are rejected . . . that's the principle of operation of Sturtevant Air Separators.

The benefits you derive from this separator are—increased output by as much as 25% to 300% . . . lower power costs by 10% to 50% . . . reduced maintenance.

A typical on-the-job example is as follows—a 16 ft. separator takes a feed of 750 tons per hour containing only a small percentage of the desired product and delivers 30 tons of material 90%, minus 200 mesh.

Investigate Sturtevant Air Separators today. Write for information and bulletin.



RING ROLL MILL

Capacities from 12 to 18 tons per hour. Range 10 to 200 mesh. Use this mill in closed circuit with Sturtevant Air Separators.

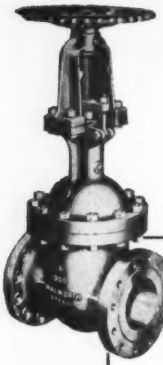
STURTEVANT
MILL COMPANY
101-A *Clayton Street, Boston 22, Massachusetts*
Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

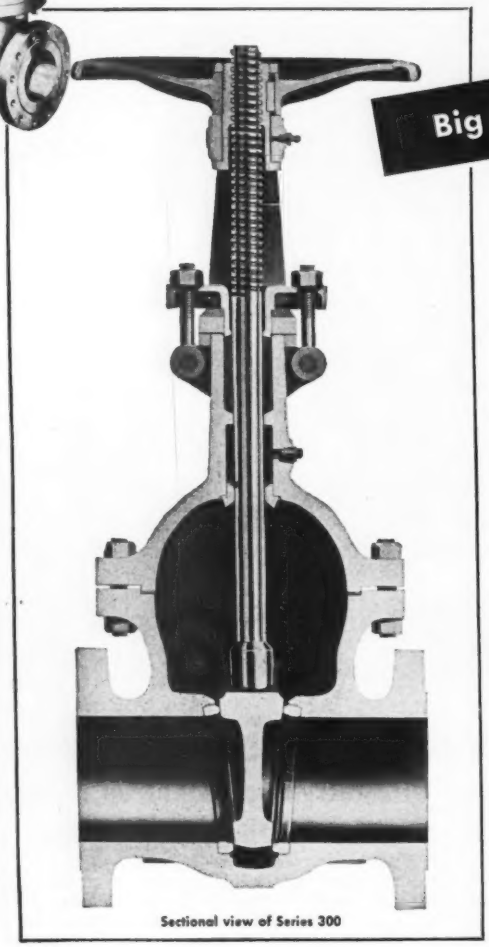
WALWORTH

Cast Steel Gate Valves

Series 150 and 300

Wedge Gate — Outside Screw and Yoke





Sectional view of Series 300

Big 8-Point Superiority!

Gland clearances are such that stem cannot be scored if gland should be tightened unevenly.

Deep Stuffing Boxes in all sizes (2″ to 24″) insure tightness and maximum packing life – costly leaks are eliminated.

Bonnets and Bodies are engineered to withstand pressure and minimize distortion – they're tough, durable, dependable.

Heavy Steel Walls provide extra strength and longer life.

Integral Body Guide Rib Faces are machined to insure accurate disc seating.

Seat Rings are bottom seated – not flange type. No recess exists at back of ring – hence no turbulence, erosion, or pressure drop.

Streamlined Ports allow high velocity, non-turbulent flow, and reduce the possibility of erosion.

Valves regularly have flanged ends. They can be supplied with ends for butt welding. Roller bearing yokes are available. On valves 5 inches and larger, by-passes can be furnished.

For Series 600 and higher, we recommend Walworth Pressure-Seal Steel Gate Valves.

For further information on Walworth Cast Steel Gate Valves, see your local Walworth distributor, or write:

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.

This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.

These are the cost-reducing Blowers that give up to 100% more air

Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corp., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
285 Park Avenue, Worcester 2, Mass.

Please send.....Bulletin 130

Name.....

Company.....

Address.....

GM Diesel Case History No. 517-28

USER: U.S. Steel Company--
McDonald, Ohio, slag dump.

INSTALLATION: 4 Euclid 15-ton rear dumps powered by GM 6-71 Diesels. 2 Haiss loaders powered by GM 3-71 Diesels. Allis-Chalmers HD-5 tractor powered by GM 2-71 Diesel.

PERFORMANCE: Each of the engines in the Euclids has operated 11,000 hours to date without overhaul.* 3 Euclids hauling to crusher handle 2100 tons per 10-hour day on 500 to 1000-yd. haul cycles. *Piston rings replaced in 3 engines at 10,000 hours.

THIS DIESEL has worked 11,000 hours without overhaul

Power users who standardize on General Motors Diesel for all equipment on the job, as U. S. Steel has done in this particular operation, can be sure of maximum return on their investment. GM Diesel's faster acceleration means more work output and smoother 2-cycle operation also has given longer engine life. And, with most parts interchangeable, all Series 71 engines can be serviced with one small stock of basic parts. While always reporting what combination and balanced users have told us [illegible] we say—

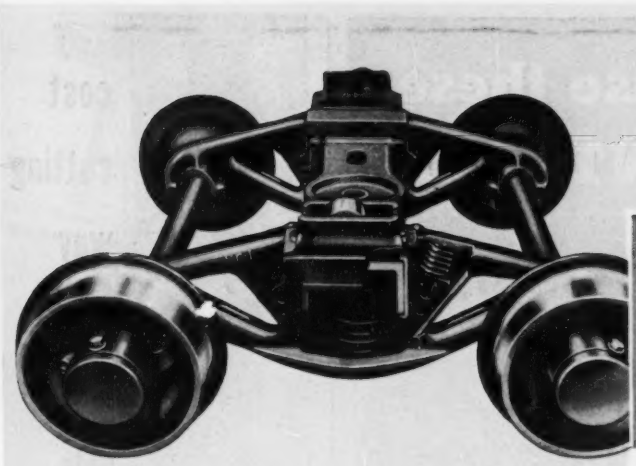
It pays to Stand[illegible] on

[illegible]

GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN

[illegible]

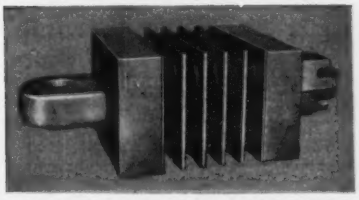


The NC-1 Truck climaxes 20 years of intensive research, providing (through the friction control mechanism shown in cutaway) protection to equipment, roadbed and lading with maximum wear life.

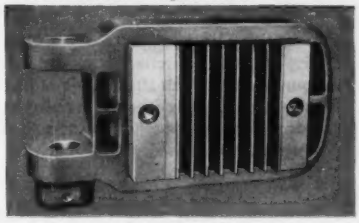
Willison Automatic Couplers save time with maximum safety . . . can be coupled at either end of car or locomotive . . . require no manual assistance. Close coupling eliminates damaging slack, permits high speeds with maximum stability.

NATIONAL *products cut per ton costs!*

Latest example of National's pioneering in better equipment is the NC-1 Truck. Its sweeping advancements over conventional trucks include long soft springs, a friction mechanism—controlling vertical and transverse oscillations, a cast one-piece bolster with large lubricated center connection, and automatic frame alignment. The NC-1 has been designed with the same factor of safety that is required by the Association of American Railroads for full size railroad trucks, and embodies the same features which A.A.R. tests have shown to be essential to produce good riding qualities. For the best in profitable equipment, *always specify National products.*



National M-230 Rubber-Cushioned Draft Gear for cars operating through rotary dump. Soft initial-action, high-capacity rubber pads provide maximum impact protection, lengthen equipment life. Available in a range of capacities and design variations to fit individual requirements.



M-225 Rubber-Cushioned Draft Gear for locomotives and large capacity cars not required to operate through rotary dump. Maximum protection in minimum space.

A-3863

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

Willison Automatic Couplers • Friction & Rubber Draft Gears • Car Trucks • NACO Steel Wheels • NACO Steel Links & Swivel Hitchings

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY Est. 1868

Can you use these 4 ADVANTAGES of HERCULES Flattened Strand wire rope?

1. 10% Stronger
2. Proportionately Safer
3. Longer Lasting
4. Easier on Equipment

Have you experienced the *extra* advantages of Hercules* Flattened Strand wire rope?

Where properly applied, this exceptionally strong, durable rope produces amazing results. Some users report more than three times the service, compared with ordinary rope.

Hercules Flattened Strand packs more steel than any other construction. It spreads wear over *four* wires of each strand — not just one. It runs smoother. It lasts longer. It reduces groove wear. It increases safety factors in almost direct proportion to its extra strength.

It will pay you to find out!

Now, more than ever, the *extra* economy of Hercules Flattened Strand really *pays off*. Ask your Leschen wire rope specialist about it.

*Reg. U.S. Pat. Off.

LESCHEN WIRE ROPE

Flattened Strand • Non-Rotating • Slings
Preformed • Round Strand • Locked Coil

A. Leschen & Sons Rope Co., St. Louis 12, Missouri.
In business only to make wire rope — better wire rope — since 1857.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

cost cutting way to long hole drilling

THE FIELD-PROVEN ROK-BIT WAY

No heavy capital investment. Complete, revolutionary facts in Bulletin EMJ-252. Rock Bit Sales & Service Co., 2415 E. Cumberland St., Philadelphia 25, Pa. • 350 Depot St., Asheville, N. C.

ROCKBIT
SALES AND SERVICE CO.

CARBIDE ROK-BITS • INTRA-SET DRILL STEEL • LONG HOLE DRILLING TOOLS • HOLE-SAVER • ALL TYPES OF HOLLOW DRILL STEEL

TEAMWORK PAYS OFF. The gigantic walking dragline needs level ground to move on, and the Big Red TD-24 has the power and speed to level it and keep ahead. The TD-24 has the greatest working drawbar horsepower of any crawler on the market and other outstanding features that produce more work at less cost.

Piling it Up for Pyramid

International power will pile it up for you

Pyramid Coal Corporation produces 6,500 tons of soft bituminous coal a day from a mine near Pinckneyville, Illinois. And two Big Red International TD-24 crawlers help do it.

"There's a world of power in those TD-24s and they handle just the way an operator wants them to," says operator Ruby Presswood. "I've dozed chunks of dirt bigger than the tractor itself. One day I moved more dirt than two other big crawlers combined on the same job."

You can put performance like this to work for you. See your International Industrial Distributor right away.

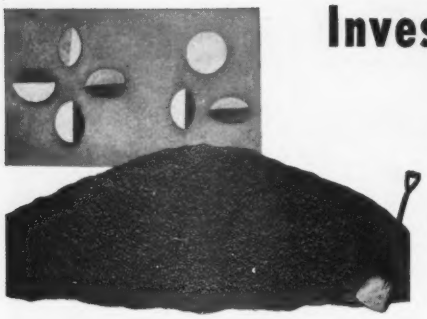
INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

INTERNATIONAL

INTERNATIONAL HARVESTER

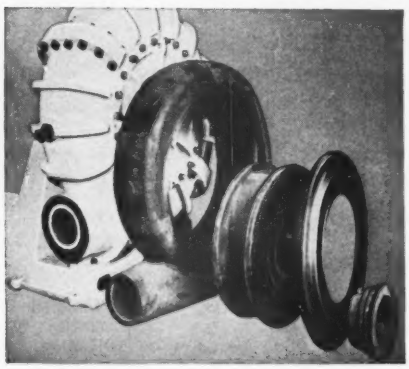
POWER THAT PAYS

Investigate NI-HARD for your ABRASION PROBLEMS



SEE FOR YOURSELF why NI-HARD cuts grinding costs. Unlike other cast irons, NI-HARD is composed of a multitude of hard carbides firmly embedded in a matrix which is as hard as fully hardened steel. Ni-Hard balls are produced in sizes from ⅝" to 1¼". Balls at left above are sectioned to show soundness.

THESE BALL MILL LINERS of chilled NI-HARD replace rolled steel liners for milling ores. The user previously used all types of liner materials, including manganese steel, chilled iron, etc., before standardizing on NI-HARD.



SOLIDS-HANDLING PUMP PARTS, produced to take full advantage of NI-HARD, include impellers, shell liners, suction side liners, engine side liners, throat and seal rings.

NI-HARD is produced by authorized foundries from coast to coast

Ni-Hard® . . . an abrasion-resisting nickel iron . . . has proved the answer to hundreds of problems involving severe abrasive wear. During the past 20 years it has set notable records for length of service, down-time saving and *ultimate economy* where wear-resistance is the primary requirement. A few typical Ni-Hard applications are illustrated.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of NI-HARD for many end uses in defense and defense supporting industries. There are authorized foundries, from coast to coast, equipped to produce NI-HARD castings in all common forms and shapes.

SOURCES OF SUPPLY FOR NI-HARD CASTINGS

EASTERN SECTION...

Plattsburg
Foundry & Machine Co.
18 White St.
Plattsburg, N. Y.

Engineered Castings Div.
American Brake Shoe Co.
10 Mount Read Boulevard
Rochester 11, N. Y.

Brake Shoe
& Castings Div.
American Brake Shoe Co.
230 Park Ave.
New York 17, N. Y.

American
Abrasive Metals Co.
460 Coit St.
Irvington 11, New Jersey

Palmyra Fdry. Co., Inc.
Arch St. Station
Palmyra, New Jersey

U.S. Pipe & Fdry. Co.
Burlington, New Jersey

Hardinge Mfg. Co.
240 Arch Street
York, Pa.

Link-Belt Co., Olney Fdry.
180 W. Duncannon Ave.
Philadelphia 20, Pa.

New Castle Fdry. Co.
Mahoning Ave. &
Hobart St.
New Castle, Pa.

The Pennebacker Co.
Emmaus, Pa.

Sprout,
Waldron & Co., Inc.
Sherman St.
Muncy, Pa.

Treadwell Engrg. Co.
Lenox & 25th Street
Easton, Pa.

Weatherly
Fdry. & Mfg. Co.
Commerce St.
Weatherly, Pa.

Georgia Iron Works Co.
605 12th St.
Augusta, Ga.

Pekor Iron Works, Inc.
P. O. Box 909
Columbus, Ga.

Thomas Foundries, Inc.
3800 10th Ave. No.
Birmingham 1, Ala.

CENTRAL SECTION...

The Brom
Mach. & Fdry. Co.
3565 W. 6th St.
Winona, Minn.

Staver Foundry Co
Box 74
Virginia, Minn.

Bassett Foundry Co.
Adrian, Mich.

Calumet & Hecla Cons.
Copper Co.
Calumet, Mich.

Engineering Castings, Inc.
405 S. Linden St.
Marshall, Mich.

The Babcock & Wilcox Co.
85 Liberty St.
New York 6, N. Y.
(Plant: Barberton, Ohio)

Brake Shoe
& Castings Div.
American Brake Shoe Co.
109 N. Wabash Ave.
Chicago 4, Ill.
(Plant: Melrose Park, Ill.)

Frank Foundries Corp.
2020 3rd Ave.
Moline, Ill.

Griffin Wheel Co.
445 N. Sacramento Blvd.
Chicago 12, Ill.

Wells Manufacturing Co.
7800 N. Austin Avenue
Skokie, Ill.

Eagle Iron Works
129 Holcomb St.
Des Moines, Ia.

Helmick Fdry.-Mach. Co.
8th St. & Belt Line
Fairmont, W. Va.

Carondelet Foundry Co.
2101
S. Kingshighway Blvd.
St. Louis 10, Mo.

Keller Foundry Co.
1010 E. Jackson Ave.
Knoxville, Tenn.

Arkansas Foundry Co.
1501 East Sixth St.
Little Rock, Ark.

WESTERN SECTION...

Eagle Foundry Co.
75 Horton St.
Seattle 4, Wash.

Union Iron Works
Box 2135
Spokane 2, Wash.

Caird Engineering Works
Helena St. &
Montana Ave.
Helena, Montana

Pacific Ball Mfg. Co.
P. O. 106
Southgate, Calif.

Pacific Foundry Co., Ltd.
3100 19th St.
San Francisco, Calif.

Stanley Foundries
6009 Santa Fe Ave.
Huntington Park, Calif.

Capitol Foundry Co.
Phoenix, Arizona

Darbyshire Steel Co., Inc.
P. O. Box 352
El Paso, Tex.

Texaloy Foundry Co.
1407 Hoefgen
San Antonio 3, Tex.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

FUMEALL*

TRADE-MARK

the superior filter fabric for fume, dust and liquid filtration

SUCCESS STORY NO. 3!

"Our smelters process used battery plates and other types of scrap... FumeAll does a better job than any other fabric..."

—From correspondence in our files.

What is FUMEALL?

FUMEALL is a combination of virgin wool and synthetic staple fibers. This combination gives the undisputedly superior filtering qualities of virgin wool plus the strength, heat, acid, alkali, and moisture-resistance of synthetic fibers.†

How long does FUMEALL last?

In actual operations, **FUMEALL** is lasting 4 times as long (and in many instances much longer) as conventional all-wool filter fabrics.

How much does FUMEALL cost?

The initial cost of **FUMEALL** is little more than any good all-wool filter fabric. Yet when measured in terms of longer life and superior performance **FUMEALL** costs far less.

How resistant is FUMEALL?

FUMEALL operates successfully in temperature ranges far beyond those permitted by conventional all-wool filter fabrics (225° to 300°), has greater fire-resistance than most synthetics. In intermittent operations, moisture absorption of **FUMEALL** is 50% or less than that of conventional all-wool filter fabrics, and shows greater resistance to acids and alkalis present in various filtered fumes and liquids.

What is the porosity of FUMEALL?

You can get exactly the porosity you want with **FUMEALL**, the right weave for your specific requirements. At present, **FUMEALL** is available in 4 different weights from most porous 14-oz. to least porous 24-oz. Finer or coarser weaves are available on special order, and **FUMEALL** can be napped or unnapped to conform to various operating conditions.

What about FUMEALL sizes?

FUMEALL is "tailored to your needs". Portland Woolen Mills will weave yardage or fabricate bags to any size and specification.

FumeAll is proving highly satisfactory for vacuum filtration in drum, disc and leaf type filters as well as bag type filters. Write or send coupon for samples and details.

INDUSTRIAL FABRICS DIVISION

Portland Woolen Mills, Inc.

P. O. Box 2620 • Portland 3, Oregon

*Patent pending

†DYNEL—a product of Carbide and Carbon Chemical Division of Union Carbide and Carbon Corp.

Industrial Fabrics Division
PORTLAND WOOLEN MILLS, Inc.
P. O. Box 2620, Portland 3, Oregon

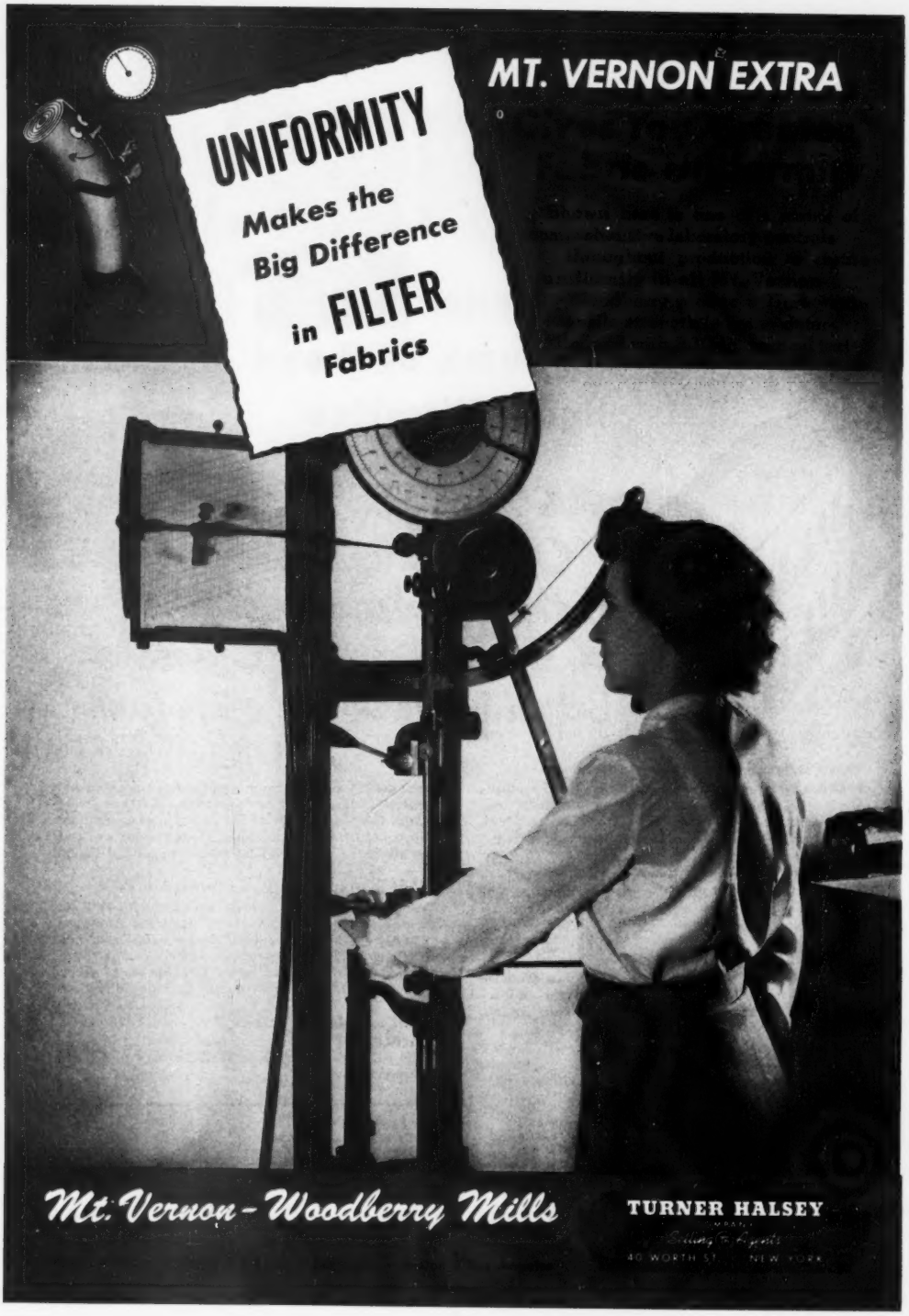
Please send me additional details and samples of **FumeAll** suitable for
☐ fume collection ☐ dust collection ☐ liquid filtration

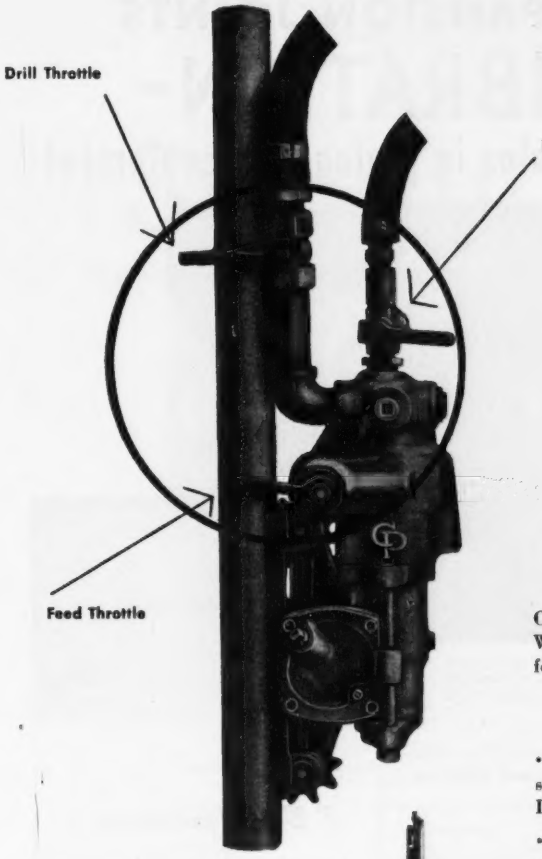
Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____


MT. VERNON EXTRA
UNIFORMITY
Makes the
Big Difference
in FILTER
Fabrics
Mt. Vernon - Woodberry Mills
TURNER HALSEY



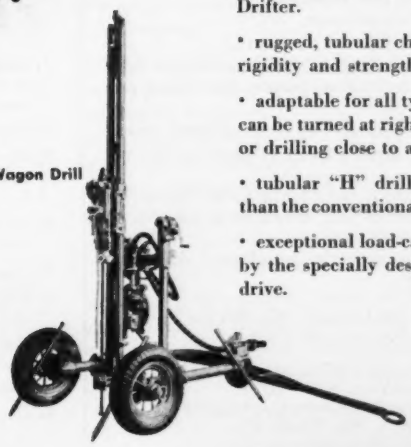
centralized controls...

for efficient operation

One of the outstanding advantages of the G-300 WAGON DRILL is the convenient grouping of drill, feed and blowing throttles.

G-300 Wagon Drill

- designed to take full advantage of the high drilling speed and strong rotation of the CP 4-inch 70-N Drifter.
- rugged, tubular chassis and drill carriage provides rigidity and strength without unnecessary weight.
- adaptable for all types of wagon drill work. Wheels can be turned at right angles to facilitate line drilling or drilling close to a ledge or wall.
- tubular "H" drill support gives greater stability than the conventional design and minimizes vibration.
- exceptional load-carrying capacity is made possible by the specially designed feed motor and cone-gear drive.



Fiftieth ANNIVERSARY

Write for further information.

CHICAGO PNEUMATIC TOOL COMPANY

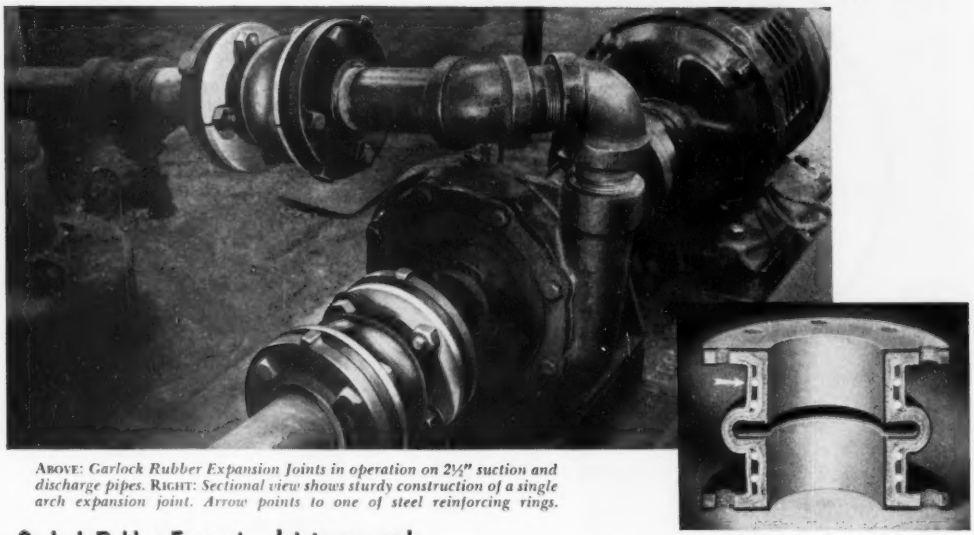
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

GARLOCK EXPANSION JOINTS

STOP VIBRATION–

relieve stresses and strains in piping and equipment



ABOVE: *Garlock Rubber Expansion Joints in operation on 2½" suction and discharge pipes.* RIGHT: *Sectional view shows sturdy construction of a single arch expansion joint. Arrow points to one of steel reinforcing rings.*

Garlock Rubber Expansion Joints are made:

- With single arch for normal expansion, contraction and vibration.
- With multiple arch for excessive pipe expansion.
- With filled arch for lines carrying sediment.
- Tapered for connecting pipes of different diameters.
- "U" type for vacuum to reduce vibration and noise on pipe lines conveying coal-laden air to pulverized coal burners and other types of light construction piping.
- With control units for excessive elongation of unanchored pipes.
- With neoprene lining for lines carrying water or air with some oil present.
- With neoprene lining and neoprene cover for lines carrying slight amount of oil and where exterior of joint is subject to oil drip or oil vapor.
- With neoprene throughout for lines carrying petroleum derivatives.
- In all pipe sizes from ¾" to 72".

Specify No. 204 for *Pressure*; No. 205 for *Vacuum*; and No. 206 for *Pressure* and *Vacuum*.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

8 Big Advantages:

1. Made of high-grade rubber, they do not crack or fracture under repeated flexing.
2. They do not take a permanent set.
3. For pressures up to 125 p.s.i. (depending upon size of joint); and for vacuum of 30 in. of mercury.
4. Suitable for operating temperatures up to 180° F.
5. They do not corrode or erode.
6. They are light in weight and can be installed in a limited space.
7. They require no gaskets between the flanges of the joint and the flanges of the pipe.
8. They do not induce electrolysis.

GARLOCK

PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS, RUBBER EXPANSION JOINTS

Sulphur

Molten Sulphur flowing into the storage vat

Thousands of tons mined daily, but where does it all go?

Look around you in any grocery store and what do you see — canned goods of all kinds! Soups, vegetables, fruits, berries! Believe it or not, you're looking at merchandise that consumed a lot of Sulphur in the making.

Tin cans are made of tin plate. Tin plate is made of sheet steel. Sheet steel is made with the help of sulphuric acid—pickling, as they call it, the process that removes scale preparatory to plating. In 1951, the sheet division of our great iron and steel industry is estimated to have consumed 140,000 long tons of Sulphur in the form of sulphuric acid. That in itself makes quite a dent in our supplies of Sulphur. Add to this almost as much more for treating wire rod, plate, strip, bars, etc., and you can see that to make finished steel, regardless of form, the iron and steel industry must use lots of Sulphur in the form of sulphuric acid.

Right here is an excellent example of the interdependence of all of our industries. To produce steel requires a lot of Sulphur. To produce Sulphur and other mined products requires a lot of steel. This interdependence of industries is one of the country's sources of strength.

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Mines: Newgulf and Moss Bluff, Texas

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Iron ore, manganese ore, phosphates of all sizes, flotation concentrates and flue dust alone or mixed, can be sintered regardless of moisture and carbon content.

Sintering temperature easily regulated and maintained as desired, producing sinter of proper porosity and hardness, thus saving blast furnace fuel.

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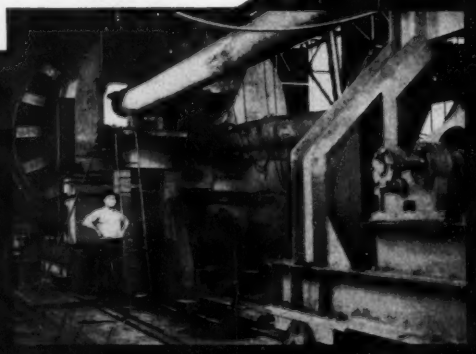
Low power consumption—7 to 8 kwh per ton of sinter.



F. L. SMIDTH & CO.

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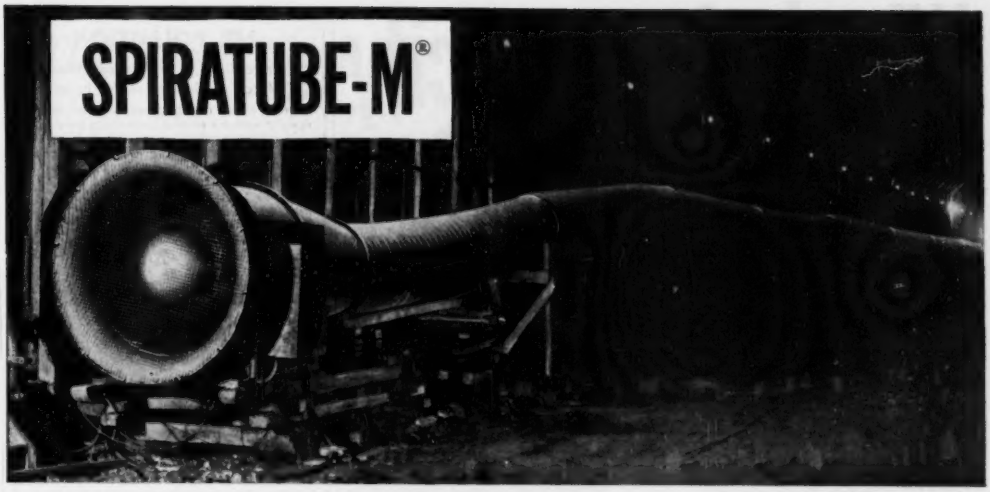

Simplify mine and tunnel ventilation

Here's the airduct that can take it! Now you can deliver air to the working face of mine or tunnel — cheaper! That's because SPIRATUBE-M is built to cut maintenance costs! Ease of handling reduces installation costs. Unique SPIRATUBE-M construction features minimize leaks and seepage. And you get the maximum efficiency of your blower or fan . . . cutting power costs!

Immediately available in diameters to 30 inches, from fully-stocked distributors, SPIRATUBE-M is made in tough high count fabrics, all specially treated and heavily coated inside and out to withstand fungus, mildew and rough treatment.

And, patented, *built-in*, quick-couplers eliminate the need for separate parts . . . no need to look for couplers when you're in a hurry.

For heavy duty, pressure ventilation tubing without wire reinforcement, ask for AYRTUBE®. Sold in diameters to 36", AYRTUBE by itself or in combination with SPIRATUBE-M offers you an inexpensive airducting.

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Handling ease

Lightweight

Flexible

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Withstands fungus, mildew, rough treatment

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If you don't know.. *don't use it!*

If it's a 5-ton pull on a 3-ton wire rope block . . . *somebody may get hurt.* But if it's an American CROSBY wire rope block, it's LOAD-RATED . . . and your men will find its safe working capacity *embossed in the side plate.* Isn't that simple safety insurance? American CROSBY blocks are built with tremendous, rugged strength . . . the same kind of quality found in big American crane blocks. Individually packaged, too, for delivery in perfect condition. Sold by distributors and supply houses everywhere; made by the makers of genuine Crosby Clips, famous wire rope fasteners... AMERICAN HOIST & DERRICK CO., ST. PAUL 1, MINNESOTA.

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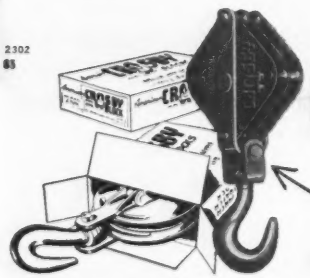

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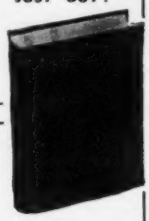
JUST OUT!



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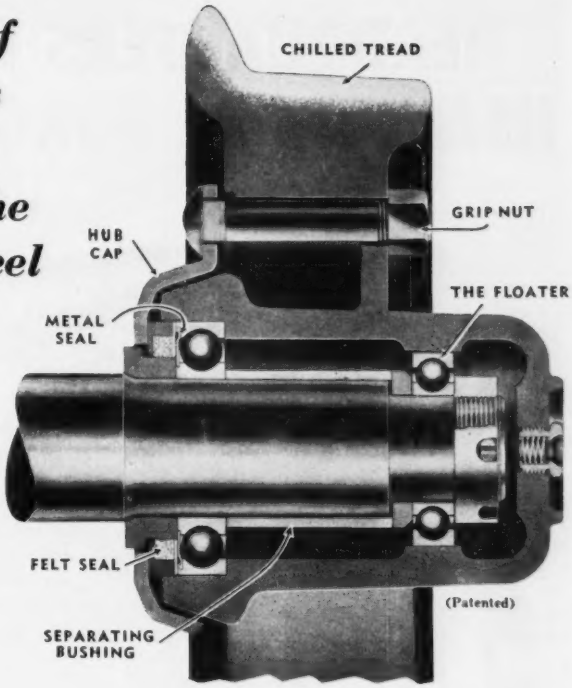
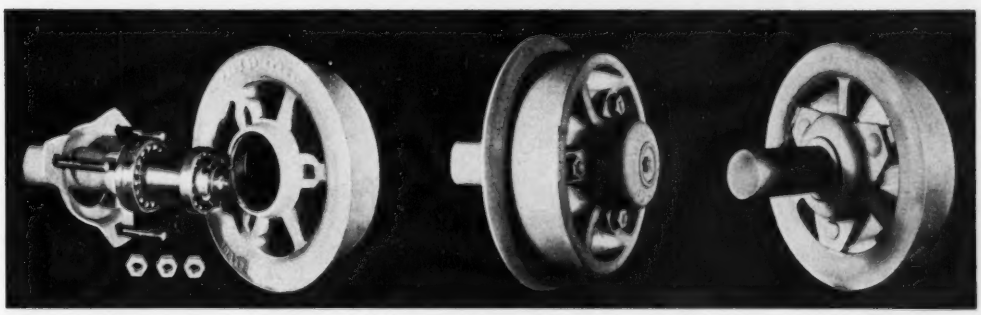
The Big Cause of Bearing Failures Was Eliminated When We Built the S-D "Floater" Wheel



There are never any loose or tight bearings on S-D "Floater" Ball Bearing Wheels. One of the two bearings "floats" into position, causing both bearings to stay automatically in perfect adjustment. This is one of the important reasons why you will have less breakdowns when your mine cars are equipped with S-D "Floater" Wheels! The magic "floating" bearing automatically adjusts itself when wheel is mounted and the three retaining bolts are pulled up tight. The extra large bearing absorbs all side thrusts and carries the bulk of the load. Any workman on the job can remove and replace a S-D "Floater" Wheel because "Floater" bearings always remain in perfect adjustment on the axle whether the wheel is off or on. Remember, too, that S-D "Floaters" have solid front hubs and positive back seals to keep foreign matter out and grease in! The low cost operation of S-D "Floater" Wheels is certainly worth investigating. Write today for complete information! Sanford-Day Iron Works, Knoxville, Tenn.



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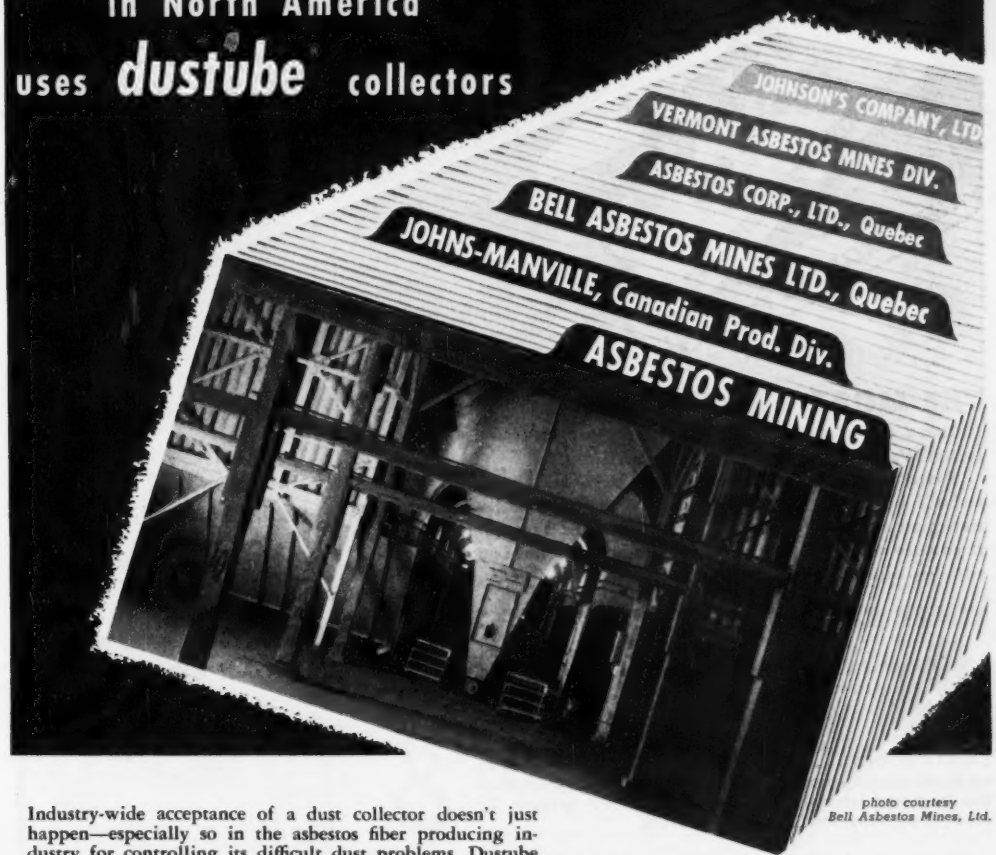

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Industry-wide acceptance of a dust collector doesn't just happen—especially so in the asbestos fiber producing industry for controlling its difficult dust problems. Dustube Collectors—the 100% choice of this industry—attained this superiority as a result of its high collecting efficiency, rugged dependable service and low cost operation. Every job was engineered for the application. Dustube engineers, with their many years of practical mining background, cooperated with the mills' engineers to arrive at the most efficient and economical equipment. The extreme flexibility of the Dustube Collector permitted its installation in existing dust sheds or plant facilities. Maintenance costs have been negligible—in fact at one mill tube replacement has averaged only 2% per year!

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Many hitherto "impossible" dust conditions in the mining and metallurgical industry have been controlled with virtually 100% efficiency. Dustube engineers will be glad to show you how your dust and fume problems can be handled with equal efficiency. *Write today for Catalog 72-B.*

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THE MOST COMPLETE LINE

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There are many different styles of shackles, swivels, hooks, thimbles, clips, sockets, eye bolts and other products designed for a wide variety of applications throughout industry. If you use wire rope or chain, you can be sure that Laughlin has the right — *and safest* — fittings for the job.

THESE EXCLUSIVE PRODUCTS

Safety "FIST GRIP" Wire Rope Clips . . . Fool proof, easy to install Fist Grip clips hold rope more securely, can't go on wrong. Fewer clips are required than for ordinary types, and they will not crush or distort the rope.

SAFETY HOOKS . . . The latch locks the load, will not open until released by operator. Strong, drop forged steel hook has improved latch that leaves 80% of throat opening. 15 sizes; 3 patterns, eye, shank and swivel.

"MISSING LINK" (Reg. U.S. Pat. Off.) . . . Cheaper than welding, safer than cold shut or cast link, "Missing Links" go on in a jiffy and are stronger than proof coil chain. 17 sizes from 3/16" to 1⅞".

CLEVIS GRAB AND SLIP HOOKS . . . These sturdy hooks are easily attached to any welded link chain. Pin and cotter make it easy to attach or remove for use on another job. Needs no connecting fittings or special tools.

Laughlin's new Catalog No. 150 lists the complete line of drop forged wire rope and chain fittings with illustrations, description and specifications. Write for it today.

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THE MOST COMPLETE LINE OF DROP FORGED WIRE ROPE AND CHAIN FITTINGS

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LOCATE URANIUM 100 TIMES EASIER. THE ONLY PORTABLE GAMMA RAY DETECTOR EMPLOYING CRYSTAL SCINTILLATION. DETECTS ALMOST 100% OF GAMMA RAYS IN COMPARISON TO LESS THAN 1% DETECTED BY THE GEIGER COUNTER.

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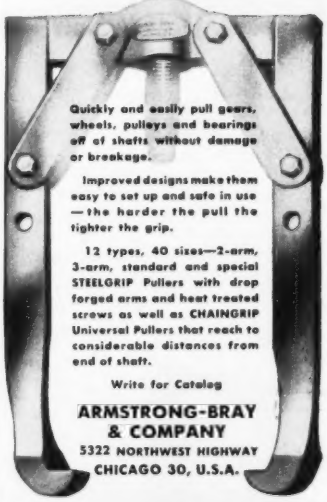
GEAR and WHEEL PULLERS



Quickly and easily pull gears, wheels, pulleys and bearings off of shafts without damage or breakage.

Improved designs make them easy to set up and safe in use — the harder the pull the tighter the grip.

12 types, 40 sizes—2-arm, 3-arm, standard and special STEELGRIP Pullers with drop forged arms and heat treated screws as well as CHAINGRIP Universal Pullers that reach to considerable distances from end of shaft.

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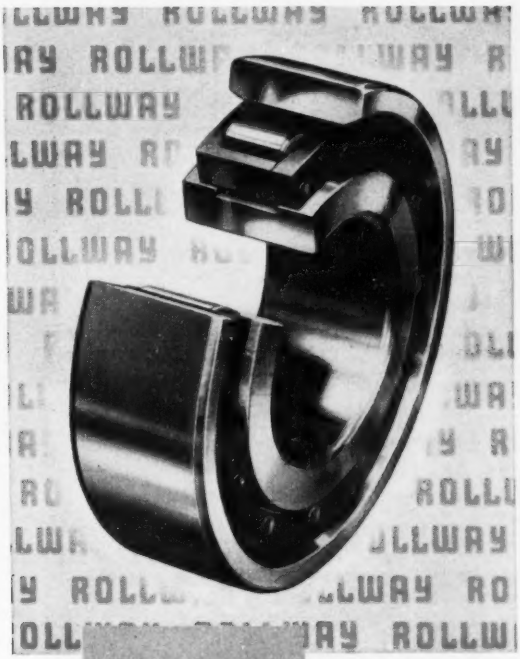
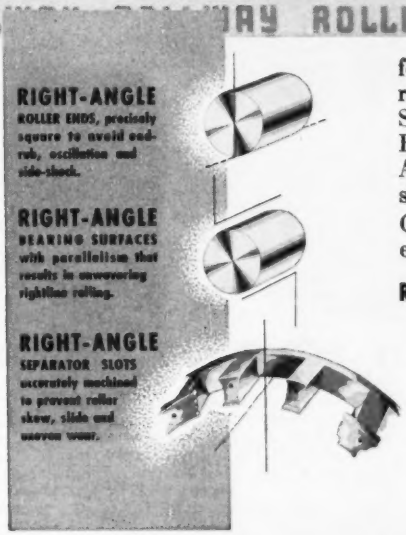


In-Built Trueness...

basis for longer life and lower cost!

Unwavering right-line rotation . . . that's the immediate result of in-built trueness in Rollway roller bearings. There's no skew, no side-shock, no roller-end-drag. Internal forces are balanced by matchless precision in related parts. Bores are precisely cylindrical. Separator surfaces are rigorously parallel. Roller ends are truly square on every diameter. And bearing surfaces match both the separator slots and the roller races.

Over the long run, life expectancy is greatly extended. Cost per unit of time falls sharply.


RIGHT-ANGLE
ROLLER ENDS, precisely square to avoid end-rub, oscillation and side-shock.
RIGHT-ANGLE
BEARING SURFACES with parallelism that results in unwavering rightline rolling.
RIGHT-ANGLE
SEPARATOR SLOTS accurately machined to prevent roller skew, slide and uneven wear.

Rollways Roll Right Because They're Made Right

Let our engineers help you to select the Rollway bearing that is exactly right for your application. Our years of specialized bearing experience and complete engineering and metallurgical service are always at your command. No cost. No obligation.

Nationwide Replacement Service: Rollway bearings are available for replacement through authorized bearing distributors in principal cities. To locate, consult classified 'phone directories under BEARINGS. Rollway Bearing Co., Inc., Syracuse 4, N. Y.

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ROLLWAY BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings

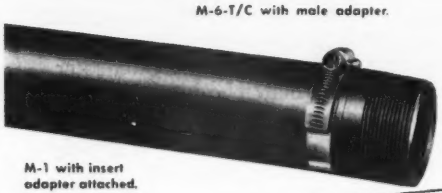
Yardley THE PLASTIC MINE PIPE that won't *rot, rust, corrode*

A TYPE FOR EVERY PURPOSE

M-6 with cement-type sleeve coupling.

M-2 flexible type.

M-6-T/C with male adapter.



M-1 with insert adapter attached.

Whatever the need . . . for cold water or corrosive liquids, suction or discharge . . . there's a Yardley Plastic Pipe for the job.

Made from rigid or flexible light-weight material. Acid and alkali resistant. Won't rot, rust or corrode. Produced in a full range of pipe and tubing sizes, ⅛" through 6". Complete line of standard fittings and adapters. Easier to install, more economical to handle.

Send for chemical resistance charts.

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142 Parsons Ave. · ADams 9315
Columbus 15, Ohio

YARDLEY M-1 and M-2 FLEXIBLE PIPE SPECIFICATIONS

PIPE SIZE	NOMINAL O. D.	NOMINAL I. D.	CALCULATED B. P. P. S. I.	APPROXIMATE WT. PER FT.	NORMAL SHIPPING LENGTHS
⅛"	.820	.620	540#	.092	400' Coils
¾"	1.080	.840	350#	.141	400' Coils
1"	1.340	1.100	200#	.179	300' Coils
1¼"	1.640	1.360	200#	.263	300' Coils
1½"	1.900	1.610	200#	.357	250' Coils
2"	2.375	2.067	170#	.434	200' Coils
3"	3.500	3.068	165#	.899	100' Coils
4"	4.500	4.026	150#	1.220	25' Straight
6"	6.675	6.065	115#	2.400	25' Straight

YARDLEY M-6 AND M-6-T/C RIGID PIPE SPECIFICATIONS

PIPE SIZE	APPROXIMATE WT. PER FT.	NOMINAL I. D.	NOMINAL O. D.	CALCULATED BURST PRESSURE P.S.I. AT 80° F.
⅛"	.053	.476	.600	700
¾"	.080	.715	.855	625
1"	.138	.970	1.140	550
1¼"	.20	1.230	1.420	525
1½"	.32	1.510	1.730	490
2"	.45	2.00	2.250	400
3"	.555	3.000	3.250	375
4"	.880	4.000	4.300	342
6"	1.940	6.000	6.440	335

M-6 and M-6-T/C recommended for working pressures up to 20% of calculated bursting pressures where temperatures do not exceed 125°. For M-1 and M-2 working pressures, use 60% of calculated burst.

Patented

RUGGEDLY BUILT FOR TOUGH CRUSHING SERVICE

Birdsboro Type C DEEP FRAME crushers represent the latest developments in large jaw crushers. They produce greater tonnages to smaller sizes because of the increased crushing area afforded by the deep frame and longer swing jaw.

Their simplified design incorporates such features as stronger cast steel frames, larger interchangeable jaw plates and removable toe lugs which account for remarkably low cost operation and minimum maintenance and repair costs.

Birdsboro Buchanan crushers are available in most any size to meet your crushing requirements. If you are looking for long, uninterrupted crushing service, it will pay you to consult with Birdsboro engineers. We invite you to make full use of their broad experience in the selection of the right crusher to do your job.

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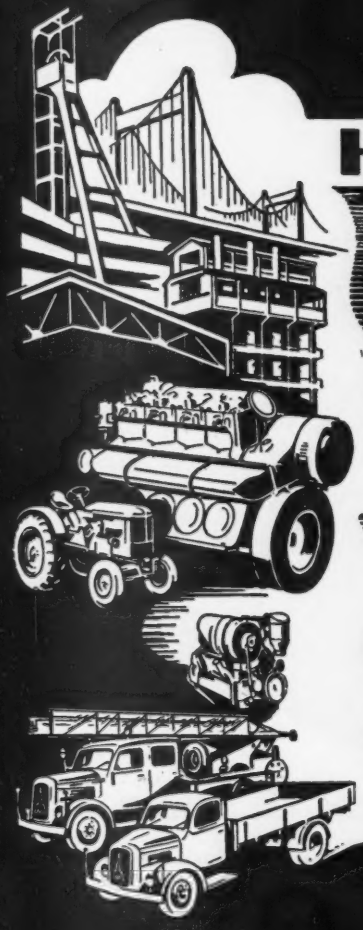

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Trucks and busses driven by air-cooled DEUTZ Diesel engines. Vehicles for municipal services. Fire ladders, fire engines. Fire fighting water trucks. Two-wheeled ladders. Fire fighting equipment.

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FILTERS

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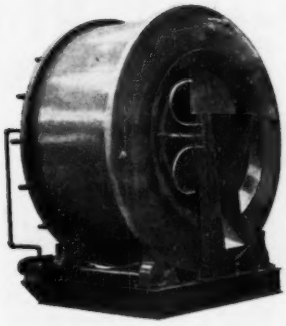
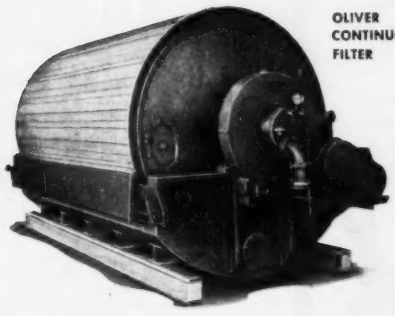


DORRCO CONTINUOUS FILTER

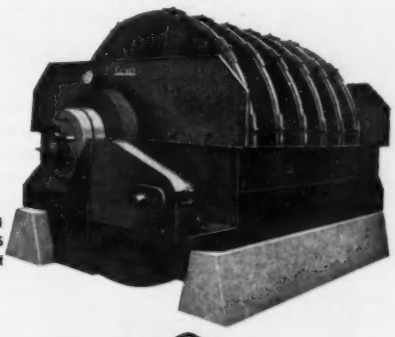
EVEN IN THE STATES, ore concentrating mills are distant enough from the factories where milling equipment is manufactured; but what of the mills in South Africa, Philippines, South America, Mexico, Scandinavian Countries? Separating distances can be measured in the thousands of miles.

Filters must be trustworthy. They must be (1) the best type for the work to be done; (2) well-made; and (3) durable. If mining companies in the States must have the best, can those in distant lands risk anything less than the best?

Oliver United, serving ore milling plants since 1907, long ago established its world wide reputation for turning out suitable and reliable filters. They predominate not only in the "big tonnage" mills in the States, Canada, Mexico and the other ore-producing countries but in the total tonnage handled. Every filter is complete with all parts included. The buyer doesn't have to shop around for needed parts when he comes to install the unit. The fact that Oliver United Engineers can offer several basic types of filters — not only Olivers, American and Dorrcos, but other types both vacuum and pressure, too — places their services in a class by itself. No other company can offer this variety of types. No other company can offer as great composite filtration experience. It will be to your advantage to make your filter station an Oliver United station.



OLIVER CONTINUOUS FILTER



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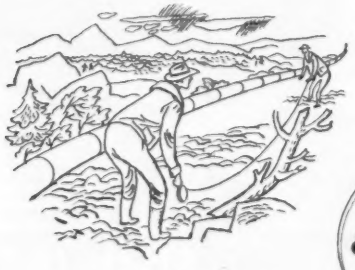

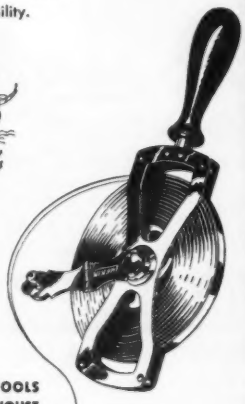

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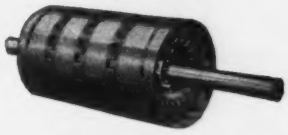

Dings *non-electric, self-energized* Perma Pulley magnets are recommended where burden depths do not exceed 3". Within this range, these are the magnets to use because of their unsurpassed concentration of magnetic strength near the surface. Catalog C-1007A.

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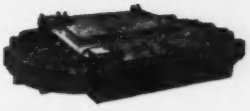

MAGNETIC DETECTOR?

The Dings Magnetic Detector instantly signals when any magnetic object large enough to be damaging passes through the detector zone. Can be hooked up to sound an alarm and stop the belt. Ideal protection for crushers, grinders, pulverizers, etc., where belt speeds are so excessive or burden depths so great no magnetic separator can function successfully. Detectors are available for belt widths from 18" to 72". Two types are available. One employs an electro magnet and the other, a permanent magnet. Performance of the two is comparable.

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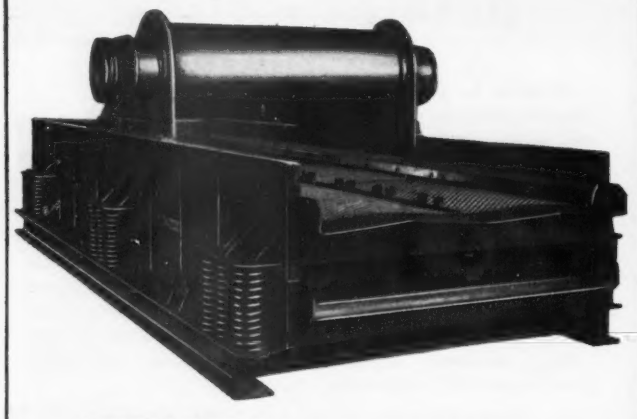
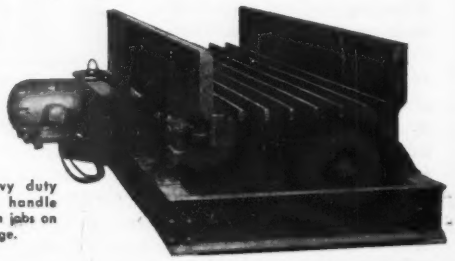
Dings Certified MAGNETIC STRENGTH



SIMPLICITY gyrating screens are doing a fast, efficient sizing and dewatering job for the metal mining industry

The 6' x 20' Simplicity Model OM Double Deck Screen shown here is typical of Simplicity Screens used successfully at the great Mesabi Range in Minnesota to size and dewater iron ore. This screen, with a ⅜" opening on the top deck and a 1½mm. dewatering surface on the lower deck, is designed for heavy media concentration of iron ore.

Throughout the metal mining industry, Simplicity equipment is handling all types of preparation work from coarse scalping to fine screening and dewatering. Simplicity operating mechanism insures fast, accurate sizing and keeps production costs down.



Simplicity heavy duty scalpers also handle tough production jobs on the Mesabi Range.

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Here's a good look at a tough job in a mine down South. It's an open pit iron mine at Coon Hill, Ga., and the star performer in the photo is a new Lorain 50-J shovel recently purchased by Woodward Mines. The "50" is loading up to 1900 yards of heavy ore per day, keeping as many as eight 5-yd. trucks busy. The Lorain works a steady 12-hour shift, and will handle 250,000 total yards in this section of the pit.

For the toughest digging in any material, mining operations can profit by exclusive features in the new Lorain-50. Two important design reasons are described at the right...but the "Balanced Quality" in Lorains gives you many more you should know about. Ask your nearby Thew-Lorain distributor for all the facts on the "50". Compare this modern profit producer with any other shovel in the 1-yard class!

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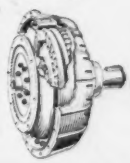

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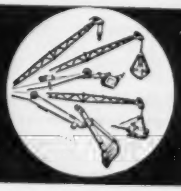

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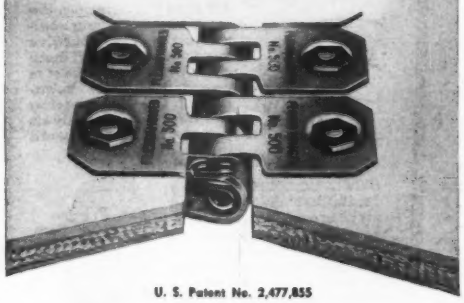

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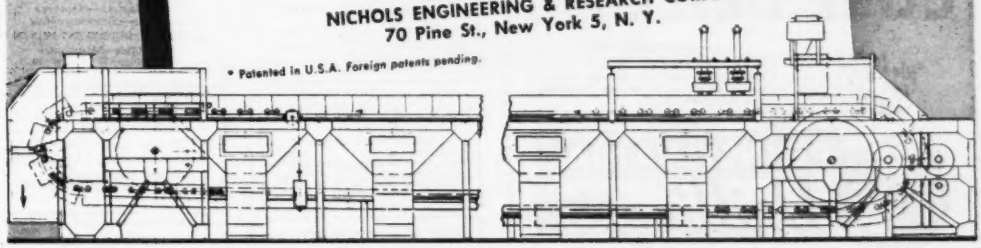
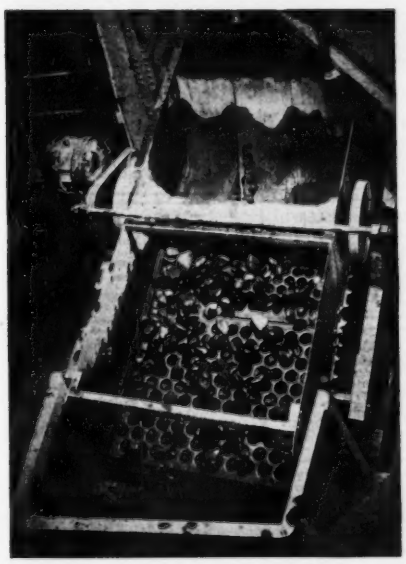


Sizing is always accurate...



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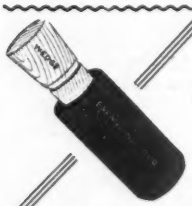

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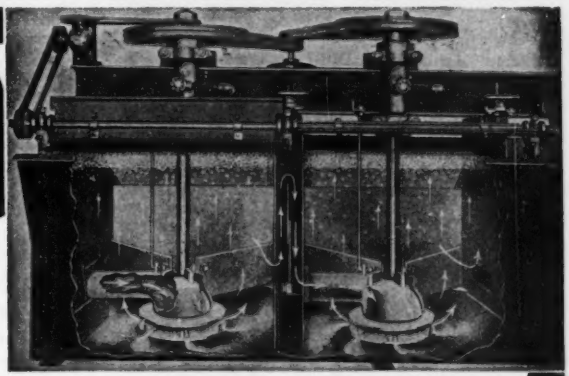

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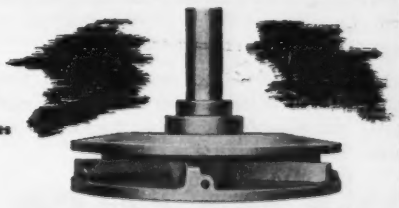

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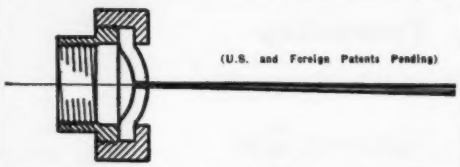

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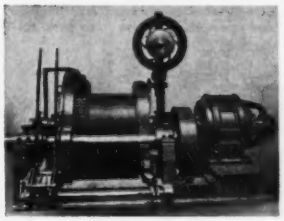

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New Dryers and Kilns.

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Setting New Crusher Standards

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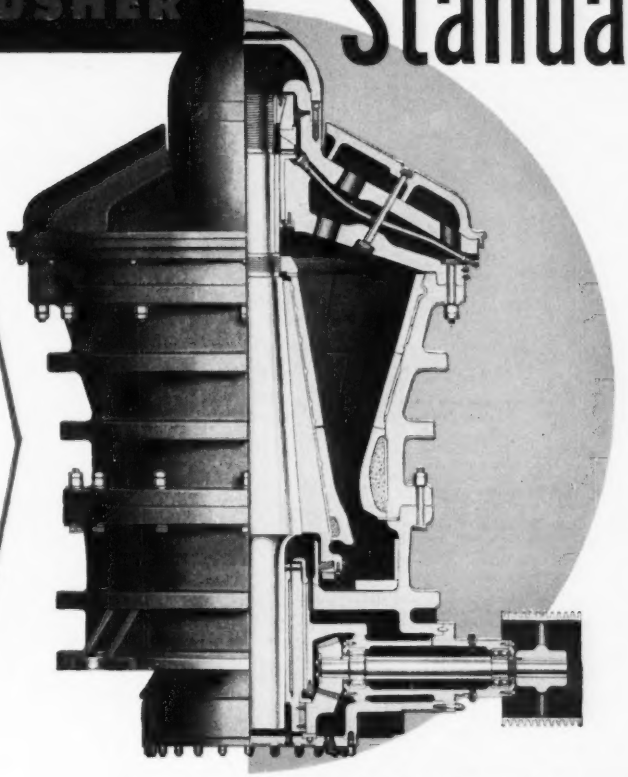
Primary & Secondary
CRUSHER



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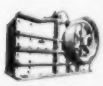
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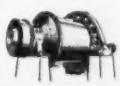
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